THE REPUBLIC OF BULGARIA

SECOND NATIONAL REPORT

ON FULFILLMENT OF THE OBLIGATIONS

ON THE JOINT CONVENTION ON

THE SAFETY OF SPENT FUEL MANAGEMENT AND ON

THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

Sofia, September 2005

LIST OF ABBREVIATIONS

AEP – Act on Environmental Protection
ASUNE – Act on the Safe Use of Nuclear Energy
BAS – Bulgarian Academy of Sciences
EC – Evaporation Concentrate
EIA – Environmental Impact Assessment
IAEA – International Atomic Energy Agency
INRNE – Institute of Nuclear Research and Nuclear Energy
LILW – Low and Intermediate Level Waste
NF – Nuclear Facility
NPP – Nuclear Power Plant
NRA –Nuclear Regulatory Agency
PRRW – Permanent Repository for Radioactive Waste
QMS – Quality Management System
RW – Radioactive Waste
RWPP – Radioactive Waste Processing Plant
RCC – Reinforced Concrete Container
SAR – Safety Analysis (Assessment) Report
SC "RW" – State Company "Radioactive Waste"
SF – Spent Fuel
SFP – Spent Fuel Pond
SFSF – Spent Fuel Storage Facility
SU – Specialized Unit

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SECTION A. INTRODUCTION

The Republic of Bulgaria signed the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (hereinafter referred to as the Joint Convention or the Convention) in Vienna on September 22, 1998. The Joint Convention was ratified by Law (promulgated in State Gazette No. 42/2000) and is in force in the Republic of Bulgaria as of June 18, 2001.

In fulfillment of its responsibilities as a contracting party on the Joint Convention, the Republic of Bulgaria prepared its First National Report on the Joint Convention and presented it to the first review meeting in the period November 3 – 14, 2003. The First National Report presented the status of compliance with the Convention requirements, the achieved safety level of spent fuel and radioactive waste management as well as the national plan for fulfillment of the obligations, pertinent to the Joint Convention.

The present Second National Report of the Republic of Bulgaria on the Joint Convention aims at presenting the progress being achieved by the country in the implementation of the Convention requirements in the period since the previous review meeting. The Report attempts, as far as possible, to avoid presenting information that was already stated in the First report and to emphasize the changes in the applicable legislation, in the national infrastructure of spent fuel (SF) and radioactive waste (RW) management and in the status of the facilities. Recommendations made during the first review meeting on the Joint Convention have been taken into account in the preparation of this Report.

The safety of spent fuel management and radioactive waste management is regulated by the *Act on the Safe Use of Nuclear Energy* (ASUNE) and the legislative acts for its implementation. During the period since the first review meeting the regulations for implementation of the ASUNE have been developed and adopted, thereby creating a modern normative system for safety of SF and RW management. The basis of these regulations includes internationally renowned principles, such as: maintenance of the radiation exposure as-low-as-reasonably-possible; clear distribution of responsibilities for the use of nuclear energy and for SF and RW management; minimization of RW generation; consideration of the interdependencies of the separate different of SF and RW management; application of the defense-in-depth concept in the nuclear facilities (NF), etc.

In accordance with the state's intention to continue the use of nuclear energy declared in the *Energy Strategy*, approved by the National Assembly in 2002, the construction of a nuclear power plant on the Belene site was approved with a decision of the Council of Ministers in 2005. The preservation of the nuclear energy share in future requires that publicly and socially acceptable long-term SF and RW management solutions should be found. The main document, formulating the strategic goals and tasks in this area, is the *Strategy for Spent Fuel and Radioactive Waste Management*, adopted by the government in 2004. In compliance with the legal requirements, public discussion was conducted prior to presenting the Strategy for approval to the Council of Ministers.

The *Strategy for Spent Fuel and Radioactive Waste Management* presents solutions for flexible and effective management of the spent fuel and radioactive waste in compliance with the human health and environment protection requirements, without transfer of responsibilities to the future generations. The Republic of Bulgaria is oriented toward a fuel cycle, during which the activities of the initial (fresh fuel fabrication) and the final (reprocessing of SF and the resulting waste) stages are performed outside of the state territory. Following the Strategy planning, in 2005, the Government of the Republic of Bulgaria took a decision for construction of national repository for low and intermediate level waste by the year 2015.

The State Company "Radioactive Waste" (SC "RW"), created in compliance with ASUNE with main function of RW management off site of their generation, started operation in 2004. Head Department and three Specialized Units (SU) have been established within the SC "RW" in order to cope with the company's multiple tasks. SU "RW – Kozloduy" operates the RW management facility at the Kozloduy NPP site, SU "PRRW Novi Han" takes over the operation of the RW disposal at "Novi Han", while SU "National Repository – RW" is responsible for performing all activities, pertinent to the construction of the National RW Disposal Facility.

Site selection and design permits and order for approval of the site for a dry storage facility for the spent fuel from the small Kozloduy NPP units were issued in 2004 and 2005.

In 2005 the Bulgarian Nuclear Regulatory Agency (NRA) issued a license for operation of a nuclear facility for management of RW generated by the Kozloduy NPP. Licensee of the facility is SC "RW" that operates it through SU " RW – Kozloduy". The facility is used for treatment and conditioning of solid and liquid low and intermediate level waste (LILW) and for storage of the produced waste packages.

Measures have been taken to improve the management of spent sealed sources within the country in the period 2003-2005. Several campaigns for collection of disused high–activity sources and for their transfer to PRRW "Novi Han" were conducted.

The international co-operation in the field of the safety of SF and RW management is of particular importance to the Republic of Bulgaria. The Bulgarian state institutions, scientific organizations, operators of SF and RW generating facilities, and operators of RW management facilities have participated in series of international initiatives, related to the SF and RW management. Especially important and beneficial to us have been the IAEA and the European Commission programs, in whose future implementation the Republic of Bulgaria intends to continue actively participate.

This report has been prepared in accordance with the "Guidelines Regarding The Form And Structure Of National Reports, INFCIRC/604, July 1st 2002", adopted on the first preparatory meeting on the Convention in December 2001. Section B describes the policies and practices of the Republic of Bulgaria on SF and RW management, according to the requirements of the Article 32, paragraph 1 of the Convention. Section C presents the understanding of the Republic of Bulgaria, on the implementation of the Convention scope of application to the situation in the country. Section D contains information on the facilities for SF and RW management, as well as inventory of SF and RW, in compliance with the Article 32, paragraph 2. The application of the Convention, Articles 4 through 28, is presented in Sections E through J. Section K reports the implementation of the planned safety improvement measures, as declared in the First National Report on the Convention and contains a list of the planned future measures. Section L presents the report appendices, compiling more detailed information on some of the reviewed aspects.

SECTION B. POLICIES AND PRACTICES

ARTICLE 32. REPORTING (paragraph 1)

"1. In accordance with the provisions of Article 30, each Contracting Party shall submit a national report to each review meeting of Contracting Parties. This report shall address the measures taken to implement each of the obligations of the Convention. For each Contracting Party the report shall also address its:

(i) spent fuel management policy;

(ii) spent fuel management practices;

(iii) radioactive waste management policy;

(iv) radioactive waste management practices;

(v) criteria used to define and categorize radioactive waste."

Policy of SF and RW management in Bulgaria

The policy of the Republic of Bulgaria in the field of SF and Raw management is defined by the ASUNE and the AEP. The RW and SF management policy comprises of:

- Prohibition of RW import into the country, except in the cases, determined by ASUNE;
- Responsibility of the persons, generating RW, for their safe management until hand-over to SC "RW";
- The generators of radioactive waste bear the cost for their management, including disposal;
- The management of RW outside of the sites of their generation is assigned to an organization, established especially for this purpose, i.e. SC "RW";
- The management of RW whose owner is unknown is responsibility of the state;
- The SF management is implemented only by NF operation licensee;
- A SF may be declared a RW if the conditions for safe storage and disposal are present in the corresponding disposal facility and if the operator had paid the due fees to the Radioactive Waste Fund.

The policy of the Republic of Bulgaria in the field of RW and SF management is based upon the moral principle for avoidance of transfer of responsibilities to the future generations. The principles of RW and SF management were initially defined in the *National Strategy for Management of Spent Nuclear Fuel and Radioactive Waste* in 1999 and, later, in the *Strategy for Spent Fuel and Radioactive Waste Management* adopted by the Council of Ministers in 2004. These documents also determine the national strategic tasks in the field of RW management, including the schedules for site selection and construction of a facility for disposal of LILW and for preliminary studies for a facility for disposal of high level RW.

The goals and measures, stated in the Strategy, are based on analysis of the present status and expert estimates of the future trends. The accumulated operational experience of the Bulgarian organizations, participating in the SF and RW management, proven international practices and all contemporary normative requirements were considered in the measures definition.

Practices of SF management

SF from nuclear power plants

In accordance with the intergovernmental agreements for construction of Kozloduy NPP units, the former USSR has been obligated to accept the Kozloduy NPP spent fuel on contractual basis. The first transfer of units 1 & 2 spent fuel was completed in the fall of 1979. According to the contract and to its addendums, signed annually, 21 shipments of SF from Kozloduy NPP Units 1 to

4 (a total of 3018 assemblies in 102 TK-6 containers) were completed in the period from 1979 to 1988.

In accordance with the original design, the Kozloduy NPP SF should be stored for 3 years in spent fuel ponds (SFP) next to the reactors and then the SF is returned to the former USSR for reprocessing. In 1985, it was decided to extend the decay period of Kozloduy NPP WWER SF from 3 to 5 years. This fact necessitated urgent construction at Kozloduy NPP site of an independent wet-type spent fuel storage facility (SFSF), commissioned in 1989. The capacity of the SFSF allows for storage of SF from approximately 10-year-operation of Units 1 to 4 and made the postponement of SF return to USSR possible.

The last WWER-440 SF transfer to Russia upon the conditions of the previous contract (free of charge) was completed in 1988, after which the SF from Units 1 to 4 has been transported mainly to the SFSF for temporary storage.

In accordance with the new Agreement between Bulgaria and Russia from 1995, the transfer of SF for storage and reprocessing with return of the high level waste, was re-initiated in 1998. In accordance with the two long-term contracts (return of SF from WWER-440 and WWER-1000), a total of 1168 spent fuel assemblies (688 + 480) have been shipped until now.

The fuel ponds of units 5 and 6 have been initially designed for 3-year storage of SF, later upgraded with dense storage racks, which allowed the spent fuel to be stored until 2001 without necessity of its transfer to the SFSF or Russia.

The Framework Agreement with the European Bank for Rehabilitation and Development provides for construction of a dry SF storage facility on Kozloduy NPP site. Development of the dry storage is being implemented as part of the activities connected to the decommissioning of the NPP units 1 and 2.

The capacity of the existing SFSF and at-reactor storage ponds (owing to the regular transfer of SF to Russia) will allow to store the SF from the operating units until 2009, when the new dry storage facility is expected to be commissioned.

In 2004, the Council of Ministers adopted the *Strategy for Spent Fuel and Radioactive Waste Management.* The Strategy contains detailed analysis of the different SF management options, considering the prognosis for the SF generation rates, estimated for operation of units 3 and 4 until the end of 2006, and for units № 5 and 6 – until 2027 and 2031, respectively. Kozloduy NPP foresees to update the *Strategic plan for safe and effective management of the nuclear fuel cycle in Kozloduy NPP*, with considerations of the main directions, given by the newly adopted Strategy.

The Strategy foresees the following short-term measurements for assurance of the spent fuel activities in the period 2005-2010:

- Regular implementation of two transfers of SF to Russia annually. The transfers will be conducted in accordance with the presently valid contract;
- Construction of the first stage of the spent fuel dry storage facility, container type;
- Realization of the possibility for dense SF storage in the SFSF and of the measures stated in the approved “Long-term program for SFSF modernization and safety enhancement”;
- Accumulations of financial assets in the Nuclear Facilities Decommissioning Fund in order to cover the expenses for the spent nuclear fuel management activities;
- In the case that two annual shipments of SF to Russia are impossible, the corresponding unrealized funds should be transferred to the Nuclear Facilities Decommissioning Fund;

The goals of SF management, stated in the Strategy, are based upon the search of balance between economics, social aspects and environmental impact. Conservative analysis of the financial resources, necessary for the SF management, has been completed and two alternatives – processing

and long-term storage followed by direct disposal, have been compared. The analysis results indicate that, in medium-term plan, the direct disposal alternative is impossible to be realized. The Strategy defines as most acceptable the alternative for complete transfer of the SF from the Kozloduy NPP site for technological storage and processing outside of the country. This alternative is considered technically feasible, based upon proven technologies, financially secured and ensuring compliance with the principle for avoidance of transfer of undue burden to the future generations. It is foreseen that the Kozloduy NPP site will be completely free of spent fuel by the year 2040.

The high level radioactive waste from the spent fuel reprocessing can be stored in the containers of the dry storage facility.

It is foreseen that the concept for high level waste disposal and the detailed investigation of the waste properties, geological limitations and existing conditions for storage construction in the country will be completed by the year 2012 г.

SF from research reactors

The spent fuel is stored at a storage facility of pool type (shaft storage), incorporated in the biological shield of the reactor.

The *Strategy for Spent Fuel and Radioactive Waste Management* considers different variants for safe transfer of SF from the site to a foreign country or to temporary storage at Kozloduy NPP site. The routes, transportation schemes, organizational, technical and financial aspects are reviewed in details for all variants. The variant with SF transfer for processing in Russia is considered the most feasible. Negotiations for signing of the corresponding governmental agreement are currently underway. A joint project between Bulgaria, Russia, USA and IAEA on transfer of research reactor SF, within the framework of the US State Department Global Threat Reduction Initiative, is also currently underway. It is expected to complete the transfer to Russia in 2006 – 2007.

Practices of RW management

RW generated at Kozloduy NPP

The main part of the RW generated at the Kozloduy NPP is low and intermediate level short lived, category 2a, as defined in the *Regulation for safety of radioactive waste management.*

The first four NPP units have been designed according to the concept of collection and storage of RW on the site until the stage of units decommissioning. In accordance with this concept, RW are stored in unprocessed or partially processed state in the design waste storage facilities of the units.

The regular operation of the RW management facility, with license holder SC “RW”, commenced in 2004. The facility is located within the Kozloduy NPP site and has a solid RW treatment line, a liquid RW treatment and conditioning line, a temporary storage for conditioned RW and an area for (buffer) storage of raw waste.

At present the RW management activities at Kozloduy NPP site include:

- Pretreatment and storage of liquid and solid RW in the NPP units and the respective auxiliary buildings;
- Processing and conditioning of low and intermediate level liquid and solid RW and storage of conditioned RW in a waste management facility operated by SC “RW”;
- Liquid and gaseous radioactive releases in the environment, in compliance with the limits, approved by the regulatory body.

The solid RW are sorted at the place of generation based on their radiometric parameters and material type. The solid activated materials with high activity, are stored in special shaft storage facilities located in the central halls of units 1 – 4 reactors and in the auxiliary buildings of units 5 and 6. The compatible low and intermediate level solid RW are processed in the SU "RW" facility for volume reduction and provision of structural stability. The waste is compressed in 200-liter drums on 2 stages – preliminary RW pressing into the drums by a 50-ton press and super-compaction of the drums with a 910-ton super-compactor. In accordance with the established criteria, the compacted RW are then packaged in a reinforced concrete container (RCC), including encapsulation in a radioactive or pure cement matrix. The solid non-compatible waste is of relatively small volume and is collected in 200-litter barrels without further processing.

Liquid RW generated at Kozloduy NPP are mostly aqueous and, of relatively smaller volume, organic waste. The technological radioactive wastewaters are collected by special systems and then processed to obtain a releasable distillate and contaminated concentrate. Following additional processing and control for establishment of compliance with the defined limits, the distillate is released into the environment. The liquid radioactive concentrate is stored in reservoirs at the Kozloduy NPP ABs, from where it is extracted for further treatment and conditioning by cementation in the SU "RW" facility. The liquid organic RW (spent sorbents) are collected and stored separately in reservoirs at the ABs.

The gaseous radioactive substances, generated by the operation of the nuclear facilities at the Kozloduy NPP site are released into the environment as authorized by the regulating body discharges.

The enforcement of the new normative system in 2004 created legal basis for clearance of low active radioactive materials but this mechanism has not been applied in practice yet. Kozloduy NPP intends to develop clearance practices compliant with the regulatory requirement by the end of 2008. Delivery of the necessary measurement equipment for verification of compliance with the clearance level is currently underway.

Information on the RW generation and processing rates is presented in the part of the report on Article 11. Information on the radioactive releases is presented under Article 25.

RW from IRT-2000

Low level liquid RW, namely distilled water from the reactor vessel, are stored at the site of the research reactor IRT-2000. The liquid RW are stored in 2 stainless steel tanks, with total volume of about 300 m^3, located in close proximity to the reactor building. Upon complete filling, the water is transported to Kozloduy NPP for processing. Such a transportation of 250 m^3 low level liquid RW took place in year 2000.

RW from nuclear applications

RW are also generated by the use of radioactive substances in about 1200 industrial, medical, agricultural, scientific research, etc., facilities. These "institutional" waste is managed in a centralized manner in the "Novi Han" PRRW.

In the last few years, main part of the generated "institutional" RW is spent sealed sources. The disused sources are handled over to "Novi Han" PRRW without prior processing, often in their original working containers.

At present, possibility for sealed sources disposal does not exist in the country; therefore, they are accepted in the PRRW for temporary storage only. According to the government *Strategy for Spent Fuel and Radioactive Waste Management* from 2004, a long-term solution for this problem will be sought after within the framework of the foreseen national disposal facility for LILW.

RW from uranium mining and milling

More than 40 mining facilities and two hydrometallurgical plants were operated within the uranium industry of the Republic of Bulgaria. Over 20 million tons of waste have been generated and accumulated in 3 tailing ponds and about 300 waste banks. In 1992, the uranium mining was ceased by a decree of the Government of the Republic of Bulgaria.

The activities associated with the uranium industry are directed towards mitigation of the consequences of the uranium ore mining and milling, within the frameworks of the management of the environment. The main goal is the environmental remediation of the areas with closed uranium mining facilities and reduction of the health risk to the population of these areas.

The radioactive waste from the uranium industry is stored safely in place and/or is disposed of in trenches in the waste banks or in the tailing ponds. Disposal in uranium mines is also allowed. The disposal technologies and locations are determined by the design projects for technical liquidation and re-cultivation. The disused radioactive sources once used as calibration sources or for technological control are managed as those from the nuclear applications.

Criteria for RW definition and categorization

The RW are defined by the ASUNE and the *Regulation for safety of radioactive waste management*. In accordance with the national legislature, SF is not a RW.

The following national "disposal–oriented" RW categorization is introduced with the *Regulation for safety of radioactive waste management*:

Category 1 – transitional RW, which may be cleared from control after appropriate treatment and/or temporary storage for a period no longer than 5 years during which their specific activity decreases below the clearance levels;

Category 2 – low and intermediate level waste (LILW), containing radionuclides in concentrations, not requiring special measures for decay heat reduction during storage and disposal; the radioactive waste from this category is additionally sub-categorized as:

Category 2a – low and intermediate level short lived waste, containing mostly short lived radionuclides (with a half-life shorter or equal to that of Cs-137) and long lived alpha emitting radionuclides with specific activity less or equal to 4×10^6 Bq/кg in individual package and less or equal to 4×10^5 Bq/кg in the entire RW volume;

Category 2b –low and intermediate level long lived waste, containing long lived alpha emitting radionuclides (with a half-life longer than that of Cs-137) with specific activity exceeding the limits for category 2a;

Category 3 – high level waste, in which the concentration of radionuclides is such that the decay heat must be considered during storage and disposal.

For the purposes of the predisposal RW management, the RW generators may introduce their own categorizations, which are subject to review and approval by NRA. Such additional categorization based upon directly measurable waste characteristics and taking into account the specifics of the applied in the facility RW treatment methods has been introduced in Kozloduy NPP.

The additional solid RW categories (for category 2 RW as per the *Regulation for safety of radioactive waste management*) are:

Category 2-I – with equivalent gamma-radiation dose rate at 0.1 m distance from the waste surface from 1μSv/h to 0.3 mSv/h;

Category 2-II – with equivalent gamma-radiation dose rate at 0.1 m distance from the waste surface from 0.3 mSv/h to 10mSv/h;

Category 2-III – with equivalent gamma-radiation dose rate at 0.1 m distance from the waste surface above 10mSv/h.

The solid RW of each of the above-listed additional categories are characterized as "compactable" (textile, wool, PVC-base waste, polyethylene, and other plastics) and "non-compactable" (metals, wood, construction waste, etc.).

The additional liquid RW categories are:

Category 2 - H – with activity concentration up to 3.7×10^5 Bq/l;

Category 2 - C – with activity ranging concentration from 3.7×10^5 Bq/l to 7.2×10^7 Bq/l;

Category 2 - B – with activity concentration above 7.2×10^7 Bq/l.

The lower activity levels for category 2-H are dependent on the radionuclide composition and the levels of unconditional clearance for the respective radionuclide determined by the *Regulation for radiation protection during activities with sources of ionizing radiation*.

The liquid RW of each additional category are characterized as "liquid radioactive concentrate", "ion-exchanging resins", "deposits and sediments" or "oils".

SECTION C. SCOPE OF APLLICATION

The entire spent fuel quantity in the territory of the country falls within the scope of the Convention.

The radioactive waste, containing only natural radioactive substances, generated outside the nuclear fuel cycle, excluding the sealed radioactive sources, is not declared as RW for the purposes of the Joint Convention.

RW, produced as a result of nuclear applications at facilities of the Ministry of Defense, is managed as the RW originating from civil programs for nuclear applications and is declared for the purposes of the Convention.

SECTION D. INVENTORIES AND LISTS

ARTICLE 32. REPORTING (paragraph 2)

"2. This report shall also include:

(i) a list of the spent fuel management facilities subject to this Convention, their location, main purpose and essential features;

(ii) an inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give information on its mass and its total activity;

(iii) a list of the radioactive waste management facilities subject to this Convention, their location, main purpose and essential features;

(iv) an inventory of radioactive waste that is subject to this Convention that:

(a) is being held in storage at radioactive waste management and nuclear fuel cycle facilities;

(b) has been disposed of; or

(c) has resulted from past practices.

This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides;

(v) a list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities."

Facilities for SF management and SF inventory

The following SF management facilities, with their respective characteristics and stored SF quantities, are located in the Republic of Bulgaria:

Kozloduy NPP facilities

Unit 1 SF pond (SFP – 1)
Location: Unit 1 and 2 central hall, immediately next to the 1st reactor;
Purpose: Storage of SF from the 1st reactor;
Method of storage: under water, on 2 racks;
Capacity (number of assemblies): 701;
Stored SF (number of assemblies /kg heavy metal): 507/58 606 kg;

Unit 2 SF pond (SFP – 2)
Location: Unit 1 and 2 central hall, immediately next to the 2nd reactor;
Purpose: Storage of SF from the 2nd reactor;
Method of storage: under water, on 2 racks;
Capacity (number of assemblies): 728;
Stored SF (number of assemblies /kg heavy metal): 494 /57 032 kg;

Unit 3 SF pond (SFP – 3)
Location: Unit 3 and 4 central hall, immediately next to the 3rd reactor;
Purpose: Storage of SF from the 3rd reactor;
Method of storage: under water, on 2 racks;
Capacity (number of assemblies): 728;
Stored SF (number of assemblies /kg heavy metal): 344 /39 533 kg;

Unit 4 SF pond (SFP – 4)
Location: Unit 3 and 4 central hall, immediately next to the 4th reactor;
Purpose: Storage of SF from the 4th reactor;
Method of storage: under water, on 2 racks;
Capacity (number of assemblies): 726;
Stored SF (number of assemblies /kg heavy metal): 285 /32 849 kg;

Unit 5 SF pond (SFP – 5)
Location: Unit 5 central hall, immediately next to the reactor;
Purpose: Storage of SF from the 5th reactor;
Method of storage: under water, on 1 rack;
Capacity (number of assemblies): 612;
Stored SF (number of assemblies /kg heavy metal): 348 /140 544 kg;

Unit 6 SF pond (SFP – 6)
Location: Unit 6 central hall, immediately next to the reactor;
Purpose: Storage of SF from the 6th reactor;
Method of storage: under water, on 1 rack;
Capacity (number of assemblies): 612;
Stored SF (number of assemblies /kg heavy metal): 207 /84 062 kg;

Separate wet-type SF Storage Facility (SFSF)
Location: on Kozloduy NPP site, in the vicinity of units 3 and 4;
Purpose: storage of SF from all Kozloduy NPP reactors;
Method of storage: under water, in a pool with 4 compartments;
Capacity (baskets): 168, under certain conditions – 200;
Stored SF (number of assemblies /kg heavy metal): 4156 /530 028 kg;

Facilities of INRNE – BAS

Shaft SF storage facility of IRT – 2000 research reactor
Location: on site of the research reactor in the city of Sofia;
Purpose: storage of SF from the IRT – 2000;
Method of storage: under water;
Capacity (number of assemblies): 108;
Stored SF (number of assemblies / kg heavy metal): 74 /75.37 kg;

More detailed information on the SF management facilities and an inventory of the stored SF are given in the appendices L-1 и L-2 of the report.

Facilities for RW management and RW inventory

The following RW management facilities, with their respective characteristics and stored RW quantities, are located in the Republic of Bulgaria:

Facilities of Kozloduy NPP

Auxiliary Building 1
Location: immediately next to the 1st and 2nd Kozloduy NPP units;
Purpose: processing of liquid RW and storage of solid and liquid RW;
Methods of treatment: evaporation, filtration;
Storage capacities/volume of stored RW [*]:
- Solid RW – 1010 m^3 / 534 m^3;
- Liquid radioactive concentrates – 2350 m^3 / 2150 m^3;

[*] at 01.01.2005.

- Spent high active sorbents – 700 m^3 / 131m^3
- Spent low active sorbents – 376 m^3 / 216m^3.

Auxiliary Building 2
Location: immediately next to the 3rd and 4th Kozloduy NPP units;
Purpose: processing of liquid RW and storage of solid and liquid RW;
Methods of treatment: evaporation, filtration;
Storage capacities/volume of stored RW:
- Solid RW – 1010 m^3 / 219,7 m^3;
- Liquid radioactive concentrates– 2350 m^3 / 1900 m^3;
- Spent high active sorbents – 700 m^3 / 95 m^3;
- Spent low active sorbents – 376 m^3 / 130 m^3.

Auxiliary Building 3
Location: immediately next to 5th and 6th Kozloduy NPP units;
Purpose: processing of liquid RW and storage of solid and liquid RW;
Methods of treatment: evaporation, filtration;
Storage capacities / volume of stored RW:
- Solid low and high active RW – 2486 m^3 / 1086 m^3;
- Solid Raw of category 2-III – 213 m^3 / 10 m^3;
- Liquid radioactive concentrates– 3600 m^3 / 2767 m^3;
- Spent sorbents – 200 m^3 / 118 m^3.

"Shaft storage facility" in central hall 1
Location: central (reactor) hall (CH-1) of units 1 and 2;
Purpose: storage of solid RW of category 2-III;
Capacity / volume of stored RW: 81,6 m^3 / 52,3 m^3.

"Shaft storage facility" in central hall 2
Location: central (reactor) hall (CH-2) of units 3 and 4;
Purpose: storage of solid RW of category 2-III;
Capacity / volume of stored RW: 81,6 m^3 / 31,8 m^3.

Facilities of SC "RW" – "RW Kozloduy"

RW Processing Unit (RWPU)
Location: on Kozloduy NPP site;
Purpose: processing of solid and liquid RW of categories 2-I and 2-II;
Methods of treatment: pressing of solid RW, evaporation of liquid RW;
Methods of conditioning: cementing, packaging in reinforced concrete containers (RCC).

Storage facility for conditioned RW
Location: on Kozloduy NPP site, immediately next to the RWPU;
Purpose: storage of the RW conditioned in the RWPU;
Capacity / volume of stored RW: 1920 RCC / 270 RCC (14%).

Storage in trenches
Location: "Lime Plant" site, at the Kozloduy NPP;
Purpose: temporary (buffer) storage of solid unprocessed RW of categories 2-I and 2-II;
Capacity / volume of stored RW: 3860 m^3 / 3546.36 m^3.

Storage yard for processed solid RW
Location: "Lime Plant" site, at Kozloduy NPP;
Purpose: temporary (buffer) storage of solid processed RW of categories 2-I and 2-II;
Capacity / volume of stored RW: 1130 m^3 / 467 m^3

Site № 1 for storage of RW in RCC
Location: "Lime Plant" site at Kozloduy NPP;
Purpose: temporary (buffer) storage of processed solid RW of categories 2-I и 2-II, packaged in RCC;
Capacity / volume of stored RW: 130 RCC / 99 RCC.

Site № 2 for storage of RW in RCC
Location: "Lime Plant" site at Kozloduy NPP;
Purpose: temporary (buffer) storage of processed solid RW of categories 2-I и 2-II, packaged in RCC;
Capacity / volume of stored RW: 2000 RCC / 20 RCC.

Site for storage of solid unprocessed RW in heavy-tonnage containers (HTC)
Location: "Lime Plant" site at Kozloduy NPP;
Purpose: temporary (buffer) storage of low level solid RW of category 2-I;
Capacity / volume of stored RW: 14 HTC* / full.

Facility of INRNE – IRT – 2000

Reservoir for liquid RW
Location: in proximity to the reactor building;
Purpose: storage of low level liquid RW;
Capacity / volume of stored RW: 300 m^3 / 8.4 m^3.

Facility of INRNE – PRRW "Novi han"

Repository for solid RW
Location: PRRW "Novi han";
Purpose: disposal of unconditioned solid low and intermediate level short lived waste (category 2a);
Capacity / volume of stored RW: 237 m^3 / 120 m^3.

Repository for biological RW
Location: PRRW "Novi han";
Purpose: disposal of biological RW and low and intermediate level short lived waste, conditioned in gypsum matrix (category 2a);
Capacity / volume of stored RW: 80 m^3 / 25 m^3.

Repository for sealed sources
Location: PRRW "Novi han";
Purpose: disposal of out-of-service sealed sources;
Capacity / volume of stored RW: 1 m^3 / 0.65 m^3.

Engineered trench for solid RW
Location: PRRW "Novi han";
Purpose: disposal of unconditioned low and intermediate level short lived solid waste (category 2a);
Capacity / volume of stored RW: 200 m^3 / 100 m^3.

Tanks for liquid RW
Location: PRRW "Novi han";
Purpose: storage of low level short lived liquid RW;
Capacity / volume of stored RW: 48 m^3 / 12 m^3.

* HTC has outside dimensions of 5.8 x 2.2 x 2.4 m.

Site for RW storage in railroad containers (RRC)
Location: PRRW "Novi han";
Purpose: storage of low level short and long lived waste (categories 2a and 2в) – fire detectors in transportation packages, solid RW and β,γ- spent sources with low specific activity, not requiring construction of an additional protection, neutron sources and α-sources in transportation packages.
Capacity / volume of stored RW: 462 m^3 (14 RRC) / 310 m^3.

Site for RW storage in concrete receptacles type "PEK", reinforced concrete containers STBKKUB and reinforced concrete containers STBKGOU
Location: PRRW "Novi han";
Purpose: storage of intermediate level short and long lived waste (category 2a and 2в) – spent sealed sources in transportation and working packaging, and loaded gamma-ray apparatus;
Capacity / volume of stored RW: 6 PEK (74 m^3), 171 STBKKUB (248 m^3), 18 STBKGOU / 114 m^3.

Site for storage of low level RW
Location: PRRW "Novi han";
Purpose: storage of low level RW in 200 l drums and in euro-pallets;
Capacity / volume of stored RW: 400 drums and 100 euro-pallets / 331.1 m^3.

Facility for RW manipulation
Location: PRRW "Novi han";
Purpose: entry RW control and identification, sorting, partial re-packaging, RW preparation for storage, decontamination of equipment and transport vehicles, processing of low active water from the special sewage system.

Facilities of the closed uranium mining and milling industry

Tailing pond Buhovo – 1
Location: 1 km east from the town of Buhovo;
Purpose: storage of the tailing, generated by the activities of the hydrometallurgical plant "Metalurg" – Buhovo, between 1956 and 1960;
Capacity / volume of stored RW: 1.3 mln. m^3 / full.

Tailing pond Buhovo – 2
Location: 1 km east from the town of Buhovo;
Purpose: storage of the tailing, generated by the activities of the hydrometallurgical plant "Metalurg" – Buhovo, between 1960 and 1992;
Capacity / volume of stored RW: 10 mln. m^3 / 4,5 mln. tons tailing and unknown quantity of solid RW.

Tailing pond Eleshnica
Location: 3 km southeast from the village of Eleshnica;
Purpose: storage of the tailing, generated by the activity of the hydrometallurgical plant "Zvezda" – Eleshnica.
Capacity / volume of stored RW: 231 dca / 9 mln. tons of tailing and unknown quantity of solid RW.

Installation for mine water treatment at "Chora" site
Location: in the vicinity of the town of Buhovo;
Purpose: treatment of mine waters, polluted with uranium;
Methods of treatment: ion exchange.

Installation for mine water treatment at "Byalata voda" site
Location: 30 km west from the town of Dolna Banya;

Purpose: treatment of mine waters, polluted with uranium;
Methods of treatment: ion exchange.

Installation for mine water treatment at "Iskra" site
Location: 10 km northeast from the town of Novi Iskar;
Purpose: treatment of mine waters, polluted with uranium;
Methods of treatment: ion exchange.

Line for regeneration of ion-exchange resins
Location: on the site of the former uranium ore processing plant "Zvezda", 3 km south of Eleshnica;
Purpose: regeneration of the sorbents, used in the installations for treatment of mine waters, polluted with uranium, at the "Chora", "Byalata voda" and "Iskra" sites.

More detailed information on the facilities and a report on the stored and disposed of RW is given in appendices L-3 and L-4 of the report.

Nuclear facilities in process of decommissioning

The Republic of Bulgaria does not have nuclear facilities in process of decommissioning.

In compliance with the licenses, issued by NRA in 2004, units 1 and 2 of Kozloduy NPP may not be used for energy production and the activities, related to them, are limited to storage of irradiated and spent nuclear fuel at the reactors spent fuel ponds. Detailed information on the plans for decommissioning of these units is presented within the scope of the First National Report on the Convention. The changes in these plans are presented by the present report on art. 26.

SECTION E. LEGISLATIVE AND REGULATORY SYSTEM

ARTICLE18. IMPLEMENTING MEASURES

"Each Contracting Party shall take, within the framework of its national law, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under this Convention."

ARTICLE 19. LEGISLATIVE AND REGULATORY FRAMEWORK

"1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management.

2. This legislative and regulatory framework shall provide for:

(i) the establishment of applicable national safety requirements and regulations for radiation safety;

(ii) a system of licensing of spent fuel and radioactive waste management activities;

(iii) a system of prohibition of the operation of a spent fuel or radioactive waste management facility without a license;

(iv) a system of appropriate institutional control, regulatory inspection and documentation and reporting;

(v) the enforcement of applicable regulations and of the terms of the licenses;

(vi) a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management.

3. When considering whether to regulate radioactive materials as radioactive waste, Contracting Parties shall take due account of the objectives of this Convention."

Review of the information, presented within the frame of the First National Report

The history of development of the legislative and regulatory framework in the field of the nuclear energy and ionizing radiation has been presented. A list of all normative acts, applicable to the management of spent fuel and radioactive waste has been given in an Annex.

Main attention has been paid to the requirements of the Act for Safe Usage of the Nuclear Energy (ASUNE), adopted in 2002. The system of licensing the activities, related to the radioactive waste and spent fuel management has been presented, including the types of permits and licenses; the duties of the NRA chairman, related to the issuance, change, renewal and cancellation of such permits and licenses. The system for state control on the management of radioactive waste and spent fuel has been reviewed. The authorities of the NRA chairman and inspectors have been pointed out. Requirements of the *Instruction for the NRA Inspection Activity* have been presented. The compulsory administrative measurements and the administrative penalties for violations in the field of the nuclear safety and radiation protection have been reviewed.

The main participants in the process of RW and SF management on national level (Council of Ministers, NRA, SC "RW", owners of permits and licenses) have been presented and the following by the law relations between them have been described.

It has been pointed out that the legislative and regulatory basis is finished only at a law level and that it is foreseen that, within a two-year period after the adoption of ASUNE, the Council of Ministers should adopt 21 regulations on ASUNE application, with, until these are adopted, the validity of the issued regulations for implementation of the old Law for Usage of the Atomic Energy for Peaceful Purposes, being preserved.

Legislation changes, related to the regulatory framework

Four, sixteen and one regulations on the implementation of ASUNE were adopted and enforced in 2003, 2004 and 2005, respectively

The *Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy* determines the order for issuance of licenses and permit for performance of activities for usage of nuclear energy and sources of ionizing radiation, as well as the order for modification, renewal, cancellation and withdrawal of licenses and permits. The order for implementation of control over the execution of the conditions of the already issued licenses and permits is also determined. The public registers of issued licenses and permits and the manner of their maintenance are described.

In accordance with the regulation, it is considered that the applicator fulfils the requirements for license or permit issuance when: he has submitted all necessary documents and complied with the NRA directions for submission of additional documentation; has fulfilled all requirements and conditions of preceding licenses, permits and other acts, issued by NRA, if they are related to the issuance of the requested license or permit; the review and evaluation of the documents presented by the applicant confirm compliance with the requirements of the law and its implementation regulations; he possesses the necessary licenses, permits and other administrative acts, issued be other administrative bodies. The Regulation defines the scope and the content of the issued licenses and permits.

The *Regulation for safety of radioactive waste management* defines the requirements, norms and rules of safety during implementation of radioactive waste management activities. The Regulation defines also the requirements, norms and rules for safety of site selection, design, construction, commissioning, operation and decommissioning of the RW management facilities.

The Regulation defines the responsibility of the persons generating RW for safe management of the waste from the moment of their generation to the moment of their transfer to the SC “RW” or their clearance from regulatory control.

The Regulation introduces categorization of the solid RW in three categories (transitional waste, low and intermediate level waste, and high level waste) and also determines the respective criteria for the category determination. The liquid and the gaseous RW are categorized according to the same criteria depending on the characteristics of the solid RW expected to be produced after their conditioning.

The Regulation determines constraints of the annual individual effective dose from internal and external radiation exposure of the population in normal operation and in the case of design basis accident. Detailed information one the dose constraints is given in the texts on Article 24 in Section F of the report.

The *Regulation for providing the safety of spent nuclear fuel management* determines the requirements for provision of nuclear safety and radiation protection of the SF management in all stages of the SF management facilities life cycle –site selection, design, erection, commissioning, operation and decommissioning. The Regulation is implemented for all activities of SF management – storage, site transportation and manipulation of SF, and the sites and facilities, related to these activities. Specific requirements for design and operation of independent SF management facilities, with “under water” and “dry” storage technologies, are determined.

The Regulations determines the constraints of the annual individual effective dose for internal and external radiation exposure of the population in normal operation and in the case of design basis accident. Detailed information one the dose constraints is given in the texts on Article 24 in Section F of the report.

The safety of the facilities for SF management is based on application of the defense-in-depth concept, exercised by implementation of a system of physical barriers preventing the spread of ionizing radiation and radioactive substances into the environment, implementation of technical and organizational measures for control and protection of the barriers and preservation of their effectiveness, as well as measures for protection of the population, the personnel and the environment

The *Regulation for the basic norms for radiation protection* defines the main requirements and measures for radiation protection during execution of activities on utilization of the nuclear energy and the use of sources of ionizing radiation. The Regulation aims at exclusion of deterministic effects occurrence and reduction of the occurrence probability of stochastic effects to a level determined as acceptable according to the international recommendations. The Regulations also defines the main principles of radiation protection, the criteria for exemption of activities from the authorization regime and the limits of the personnel and population doses.

The Regulation on the conditions and the order for execution of radioactive substance transportation is implemented for transportation of radioactive substances whose specific activity, as well as the total cargo activity, exceed the limits specified by the *Regulation for the basic norms for radiation protection* and also for natural radioactive substances and ores not intended for processing and having a specific activity exceeding the ten-fold values of the limits specified by the *Regulation for the basic norms for radiation protection.* The radiation protection during transportation of radioactive substances is provided in accordance with radiation protection programs as the character and the scope of the planned radiation protection measures should correspond to the risk level of the cargo and should comply with the requirements of the normative acts for radiation protection of the population, the personnel and the environment. The radiation protection program for radioactive substances transportation must include measures, assuring the maintenance of the personal doses, number of exposed persons and the probability of exposure as low as reasonably achievable, economical and social factors taken into account.

Other ASUNE implementation regulations, related to the SF and RW management are:

- *Regulation for the conditions and procedure for transfer of radioactive waste to the state enterprise "Radioactive Waste";*
- *Regulation for safety of the decommissioning of nuclear facilities;*
- *Regulation for providing the safety of nuclear power plants;*
- *Regulation on providing the safety of research nuclear installations;*
- *Regulation of the conditions and procedure for establishing of zones with special statute around nuclear facilities and sites with sources of ionizing radiation;*
- *Regulation for emergency planning and emergency preparedness in case of nuclear and radiological accident;*
- *Regulation for providing of the physical protection of nuclear facilities, nuclear material and radioactive substances.*

In compliance with the new *Act on the Public Health*, adopted in 2004, the Minister of Health exercises control over the public health protection activities and state health control through his subordinate offices:

- Chief State Health Inspector of the Republic of Bulgaria;
- The Regional Inspectorates for Public Health Protection and Control;
- The National Center of Radiobiology and Radiation Protection.

The Chief State Health Inspector organizes and manages the measures for protection of the population from the impact of ionizing radiation. The protection is carried out in compliance with

the principles of the radiation protection according to the *Act on the Public Health* and to the ASUNE. The protection includes:

- Monitoring of the characteristics of the working and the living environment for determination and reduction of the personal exposure from ionizing radiation sources;
- Medical examination of persons, working with sources of ionizing radiation;
- Dosimeter control for determination of the internal and external exposure of persons, working with sources of ionizing radiation;
- Evaluation of the exposure and radiation risk to the entire population or groups of it;
- Medical provision of the society as a whole, of separate groups within it and of the persons, working with ionizing radiation sources, in cases of radiation emergency.

The *Act on the Public Health* provides for the creation of a register of the persons, either working or having worked in ionizing radiation environment.

In compliance with the *Act on the Public Health*, the physical and juridical persons, performing activities with sources of ionizing radiation, are obliged to inform the Ministry of Health for the deviations, occurring during normal facility operation, which can lead to population irradiation. The state authorities, monitoring the radiation parameters of the living environment, are obliged to periodically present to the Minister of Health data, necessary for the health risk assessment.

The following regulations for application of the *Act on the Public Health* requirements are to be adopted by the end of 2005:

- *Regulation on the conditions and order of medical provision and health norms for personal protection in cases of radiation emergencies;*
- *Regulation on the conditions and order for performance of personal dosimeter control of the persons, working with sources of ionizing radiation;*
- *Regulation on health norms and requirements for work in environment with ionizing radiation.*

Complete list of the existing normative acts, applicable to the management of radioactive waste and spent fuel, is given in Appendix L-5.

Guides for implementation of the regulations

The conclusive statements of all regulations, issued in accordance with ASUNE, delegate to the NRA chairman the right to give guidelines on their implementation, including through the issuance of the respective guides, methodologies and other documents.

With the aim of gradual transition to a less prescriptive regulatory approach, NRA has prepared a long-term program for development and issuance of the respective guides for regulations application. NRA will prepare the high priority manuals by the end of year 2008, utilizing also the opportunities of the EU Phare Program and the technical co-operation with IAEA. The more important envisioned manuals, which are related to the SF and RW management, are:

- Samples of application forms (for issuance of licenses and permits);
- Manual for Performance of Periodic Safety Assessment of nuclear facilities (NF);
- Manual for Performance of Detailed Analysis of Fire Risk;
- Manual for Performance of Deterministic Safety Assessment;
- Manual for Performance of Probabilistic Safety Assessment;

- Manual for Utilization of Operational Experience;
- Program for Quality Assurance for NF at all stages – from site selection to decommissioning;
- Structure and content of NF Decommissioning Plan;
- Manual for Performance of General Emergency Exercise and Emergency Drill;
- Manual of the Requirements for Building, Equipment, Maintenance and Operation of an Emergency Center;
- Structure and content of the Safety Assessment Report (SAR) of SF Storage Facilities (wet and dry);
- Structure and content of Technological Reglament for Operation of SF Storage Facilities;
- Structure and content of the SAR of RW Storage Facilities;
- Structure and content of SAR of Facilities for RW Processing;
- Structure and content of SAR of RW Disposal Facilities;
- Structure and content of Technical Specifications for Conditioned RW Packages;
- Structure and content of RW Management Program;
- Structure and content of Program for Closure of RW Disposal Facilities;
- Structure and content of Program for Post-closure Control of Disposal Facilities;
- Clearance of material with very low activity from regulatory control;
- Qualification of RW packages.

ARTICLE 20. REGULATORY BODY

"1. Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 19, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.

2. Each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of the regulatory functions from other functions where organizations are involved in both spent fuel or radioactive waste management and in their regulation.'

Review of the information, presented within the frame of the First National Report

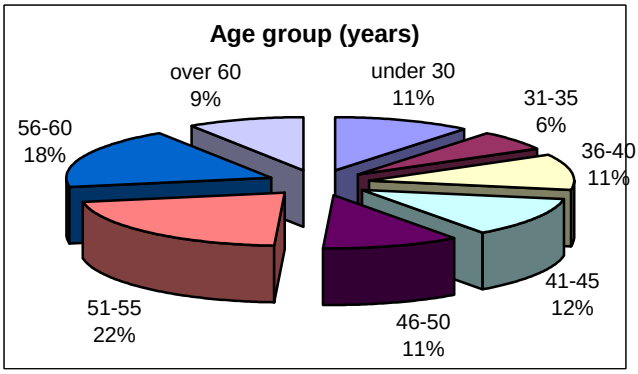
First National Report states that, in accordance to the provisions of the ASUNE, the state regulation over the safe use of the nuclear energy and ionizing radiation and over the safe management of radioactive waste and spent fuel is exercised by the chairman of NRA, an independent specialized authority of the executive power, having competence, determined by law. The chairman of the agency is appointed with a decree of the Council of Ministers for a term of 5 years and may be re-appointed for one more term. It is pointed out that, with the Law of Ratification of the Joint Convention, the chairman of NRA is appointed as a regulatory body in the sense of Article 20 of the Convention and is responsible for the co-coordinator of the reparation of the national reports on the fulfillment of the obligations of the Republic of Bulgaria, pertinent to this Convention.

The NRA organizational and management structure is appended. Detailed information on the agency's staff personnel and financing is given. The consultative councils on the nuclear safety and radiation protection, formed according to the ASUNE, are presented.

It is stated that ASUNE guarantees effective independence of the regulatory functions from the radioactive waste management functions. The functions of the Minister of Energy and Energy Resources, who conducts the state policy in the field of RW and SF management, are also described.

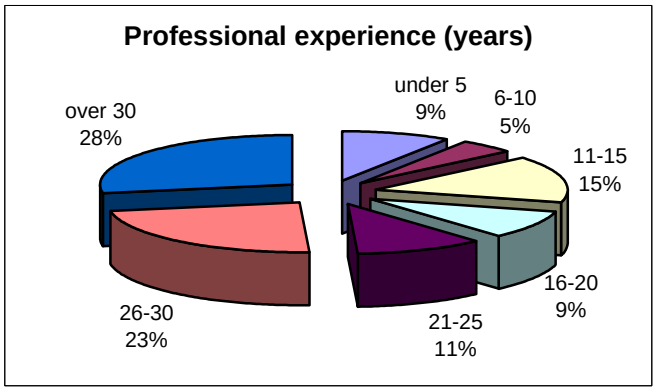
Development of the regulatory authority after the presentation of the First National Report

The structure, activity, organization and number of personnel of the Agency are determined by the *Rules of Procedure of the NRA* adopted by the Council of Ministers. In 2005, a change in the Rules of Procedure was approved with which the total number of the NRA personnel was increased by 5 staff members to reach the total of 107 people.



The general administration, which technically supports the chairman's activities and administratively serves the citizens and the juridical persons, numbers 26 staff members.

The Specialised Administration is organised into departments, which assist the Agency Chairman in performing his regulatory and control functions related to the activities with nuclear facilities, other sources of ionising radiation and emergency preparedness, nuclear material and radioactive waste. The specialized administration numbers 81 staff members.



The average age of the NRA employees is 45 years. More than 60% of the inspectors have over 20 years of experience in the field of nuclear safety and radiation protection. The relatively low average age and respectively, the significant professional experience, are one of the agency's characteristics, providing succession and preservation of knowledge within the organization. The NRA staff is appointed following a competitive examination. When selecting staff, possibilities are looked for creating succession and appointing younger staff with necessary high qualification. The high requirements imposed on the candidates are not only in the field of technical knowledge, but in personal characteristics, such as ability to work in a team, communication skills, intention for career development, etc. This results in building a joint and united team with abilities to fulfil the set tasks regardless of their difficulty.

Inspectors and experts with higher education are 97% while more than 50% of them are women. There were no civil servants that have quit their jobs, which is an evidence of the good working conditions, provided by the management. Three persons were appointed following a competitive examination and two persons were re-appointed on a managerial and expert position by an internal competitive selection.

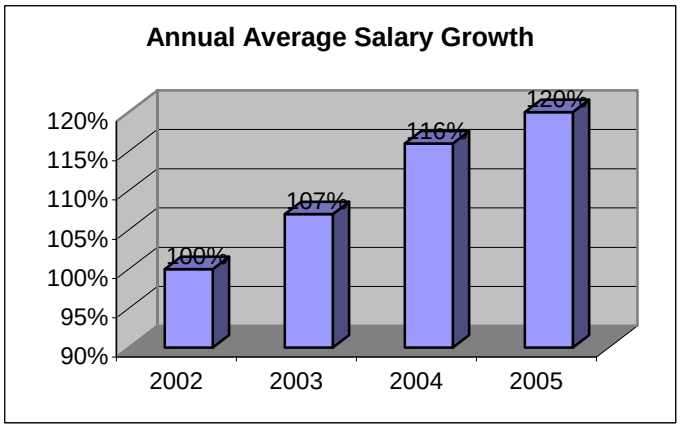
In 2003, a new Personnel Training Center has been opened in the NRA. The main financial source for building and equipment of this center was NRA budget. Part of the equipment, necessary for the center's effective work, has been provided by the US Nuclear Regulatory Commission and through IAEA within the project for support to NRA. By opening the training center, the NRA has

started implementing its program for intensive training of new employees. The performance of a sequence of national and international technical meetings, training courses and seminars aim at introducing the employees to the international practices for application of regulatory approaches, the requirements of the new regulatory framework, the development of the normative basis at a secondary level in accordance with the ASUNE and the European legislation.

In April 2005, NRA has received a mobile laboratory for radiation monitoring as a donation from the USA Government. The laboratory is assigned to the NRA emergency team, which together with the competent state authorities fulfils its obligations in the case of nuclear and radiation emergency and illicit traffic of nuclear material and radioactive substances. The inspectors from the Radiation Protection and Emergency Preparedness Department have already completed their training on the use of the mobile laboratory.

A new plan for administrative education has been prepared in implementation of the *Strategy for Training of the State Administration Personnel* adopted by the Council of Ministers. This plan is based on the personal training plans and on detailed analysis of the need from training with consideration of the agency priorities. The total number of employees that completed the administrative training is 17; three of them later assigned to management positions. The training ended with certificates, issued by the Institute of Public Administration and European Integration.

NRA experts have participated in 47 training courses organized by IAEA, other international organizations and foreign regulatory authorities in 2004. The participations in international seminars, conferences and working group meetings are more than 70. The good qualification of the NRA experts is confirmed by the fact that in 2004 agency experts served 13 times as consultants and members of international missions.



NRA activities are funded from the state budget and from the licensing fee revenues. The 2004 expenditures adopted by the Law of State Budget, increased by 13 % in relation to 2003. The growth of the average salary of NRA staff is 20 % compared to the end of 2002.

In 2003, an IAEA mission for review of regulatory activity (IRRT mission) was conducted. The main conclusions of the review team, stated in the review report, are: Bulgaria has created an effective system for nuclear regulation; the funding and staff recruitment mechanisms provide NRA with the necessary resources for independent implementation of its regulatory activities; NRA has experienced and competent personnel, motivated to work at the highest level. The experts also witnessed a number of good practices, which were documented for use of other regulation authorities.

SECTION F. OTHER GENERAL SAFETY PROVISIONS

ARTICLE 21. RESPONSIBILITY OF THE LICENCE HOLDER

"1. Each Contracting Party shall ensure that prime responsibility for the safety of spent fuel or radioactive waste management rests with the holder of the relevant license and shall take the appropriate steps to ensure that each such license holder meets its responsibility.

2. If there is no such license holder or other responsible party, the responsibility rests with the Contracting Party, which has jurisdiction over the spent fuel or over the radioactive waste."

Review of the information, presented within the frame of the First National Report

The First National Report presents the ASUNE requirements, related to the RW and SF management activities. It is stated that the radioactive waste and spent fuel management is executed solely by juridical persons after receiving a permit and/or license for the safe performance of the respective activity. The licensee obligations and responsibilities following from the ASUNE are presented in details.

The report describes the legislative provisions (art. 73 of ASUNE) for assignment of responsibility to the state when the person, responsible for the spent fuel or radioactive waste management can not be identified.

Legislation changes, related to the responsibility of permit or license holder

In accordance with the ASUNE requirements, several regulations clarifying the law requirements for licensee responsibility were adopted in 2004.

In compliance with Chapter 4, section I of ASUNE, the SF management shall be performed by a person, holding a license for NF operation. The Council of Ministers may declare SF a RW if conditions of safe storage and disposal at a respective facility are present.

In accordance with Chapter 1 of the newly adopted *Regulation for safety of radioactive waste management* the licensees implement measures for provision of safe RW management, such as:

- consider the interrelations between all activities of RW generation and management;
- apply targeted management approach to different RW streams, considering their specific features;
- implement technologies and procedures, corresponding to the scientific and technical achievements, and to the internationally renowned operational experience;
- implement measures for minimization of the RW, subject to disposal, with respect to their volume and activity, by application of appropriate processing technologies, temporary storage for radioactive decay and limitation of the RW generation;
- provide for a timely RW processing resulting in a product, ensuring their safe storage and disposal;
- provide for RW disposal within the shortest possible period after their generation;
- maintain RW records in accordance with the regulation's requirements;
- provide safety of the RW management facilities in all stages of their existence;
- assess the safety of the RW management facilities in all stages of their existence;
- support financially the RW management activities.

The Regulation mandates that the persons, as a result of whose activities RW are generated, are responsible for the safe management of these RW until the moment of their transfer to the SC "RW" or of clearance from regulation control.

In compliance with the *Regulation for the conditions and procedure for transfer of radioactive waste to the state enterprise "Radioactive Waste",* subject of transfer are:

- radioactive waste, generated as a results of activities of licensee and permit holders in the sense of ASUNE (RW manufacturers);
- radioactive waste from past practices;
- radioactive waste with unknown owner;
- radioactive waste, imported in the territory of the Republic of Bulgaria, which may not be returned;
- radioactive waste, generated as a result from activities of RW manufacturers of declared bankruptcy or liquidation.

In all cases, the licensee bears the responsibility for provision of nuclear safety, radiation protection and physical protection during license termination until issuance of new license or until safe decommissioning of the facility (art. 22, par. 3 of ASUNE).

ARTICLE 22. HUMAN AND FINANCIAL RESOURCES

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

(i) qualified staff is available as needed for safety-related activities during the operating lifetime of a spent fuel and a radioactive waste management facility;

(ii) adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning;

(iii) financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility."

Review of the information, presented within the frame of the First National Report

The First National Report presents the ASUNE requirements for availability of sufficiently qualified and certified personnel with the respective educational and training level, for all operation activities of SF and RW management facilities. The system for qualification and performance of specialized training of NF personnel has been presented.

The report provides description of the ASUNE conditions for issuance of a NF operation license related to availability of financial and material resources for maintenance of high safety level throughout the entire operation period, as well as for decommissioning of the SF and RW management facilities. Correspondingly, information on the human and financial resources of the operator of SF and RW management facilities has been appended.

Information for the financing of the RW management activities through creation of the Nuclear Facilities Decommissioning Fund and Radioactive Waste Fund is presented, too.

Legislation changes, related to the availability of human and financial resources

The *Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy*, adopted in 2004, specifies the documents, which the applicant must present together with license or permit issuance application, and by which he certifies the compliance with the above-stated requirements. Within the scope of the license issuance procedure, the regulatory authority

evaluates the correspondence of the presented documents to the requirements of ASUNE and of the regulations issued on its implementation.

The newly adopted *Regulation of the conditions and procedure for acquiring professional qualification and for the procedure for issuing licenses for specialized training and certificates for qualification for use of nuclear energy* specifies:

- the conditions and order for acquisition of professional qualification for activities in nuclear facilities and with sources of ionizing radiation;
- the order for qualification acquisition;
- the order for issuance of specialized training licenses;
- the requirements for the system of personnel selection and qualification;
- the requirements for qualification and mandatory specialized training of the NF personnel, including the minimal requirements for training programs content and for the training duration for specific positions in the various NF types.

New regulations on determination of installment, order of installment collection, expenditure and control of the assets of the Nuclear Facilities Decommissioning Fund and Radioactive Waste Fund were adopted in the end of 2003. The adoption of these regulations guarantees the collection of sufficient funds for the NF decommissioning and for the long term RW management (including disposal), with the funding being provided by the payments of NF operators and/or RW generators, from the state budget, bank interests and donations.

Financing of Decommissioning and RW management

The financing of the SF and RW management during the facilities operation is provided by the operator. The financing of decommissioning and management of RW after their transfer to SC "RW" is provided by the Nuclear Facilities Decommissioning Fund and Radioactive Waste Fund. The Funds are independent, the available assets are managed transparently and in a manner, assuring their profitability, and, according to the valid legal regulations, expenditure control is exerted, with the expenditures being allowed only for justified purposes, consistent with the fees paid to the Funds.

Information on the Radioactive Waste Fund assets activity, per years:

REVENUES

Years	Received amounts, in BGL				
	NEK-EAD	Kozloduy NPP		Others	TOTAL:
		Installment	Interests		
1999	4 230 000	-	-	983 219	5 213 219
2000	18 349 492	9 026 434	-	65 091	27 441 018
2001	12 567 000	13 249 909	-	542 365	26 359 274
2002	10 209 391	23 209 755		1 088 534	33 567 189
2003	-	23 447 914	553 394	1 467 659	25 468 967
2004	-	21 229 964	1 655 827	355 342	23 241 133
Till 30.06.2005	-	8 911 598	447 178	70 892	9 429 668
Total:					150 720 468

EXPENCES

Years	Paid amounts, in BGL				
	BAS – INRNE	Kozloduy NPP	Others	SC "RW"	TOTAL:
1999	373 250	1 978 845	29 108	-	2 381 203
2000	1 983 543	4 511 875	83 950	-	6 579 368
2001	3 497 820	7 124 660	126 160	-	10 748 640
2002	3 334 296	7 045 664	55 510	-	9 439 784
2003			67 891	-	4 210 148
2004	170 538	159 514	51 608	6 831 969	7 213 628
till 30.06.2005	-	-	31 891	3 683 142	3 715 033
Total:					44 287 804

Information on the Nuclear Facilities Decommissioning Fund and the asset activity of the Fund is presented in the texts on Article 26.

Information on the practical application of this Article by the operators of SF and RW management facilities is presented in Appendix L-6.

ARTICLE 23. QUALITY ASSURANCE

"Each Contracting Party shall take the necessary steps to ensure that appropriate quality assurance programs concerning the safety of spent fuel and radioactive waste management are established and implemented."

Review of the information, presented within the frame of the First National Report

The First National Report has presented the ASUNE requirement for the persons conducting activities of radioactive and spent fuel management to maintain high level of the quality of the performed activities. The requirements of the regulations in force at that time have also been presented. It has been pointed out that the implementation of the quality assurance program is controlled by NRA during the regulatory inspections. Information on the quality management systems in place in Kozloduy NPP, PRRW "Novi han" and the research reactor of BAS is presented.

Legislation changes, related to the quality assurance

The ASUNE requirements for quality assurance are developed in detail by the law's implementation regulations adopted in 2004.

Chapter 7 of the *Regulation for providing the safety of spent nuclear fuel management* requires that the operating organization shall develop and have an approved policy and quality assurance program (QAP) and shall provide the necessary organization for their application. The assurance of nuclear safety and radiation protection shall be a priority of the quality policy. The quality assurance program shall contain the necessary arrangements, providing for the training and qualification of the personnel; control of the design activities; control of the construction and installation works; documentation management; control of delivery of materials, equipment and services; control of manufacturing; inspection control and testing; the metrological support; the assurance of reliability of safety-related systems and components; discrepancies control. Through the quality assurance program, the operating organization must assure effective control of the execution quality of the SF management activities as well as implementation of the program itself.

Chapter ten of the *Regulation for Safety of Radioactive Waste Management* requires that the persons, performing activities of RW management, shall implement a quality assurance system, which guarantees:

- effective organization of the activities, related to the RW management, and the operation, maintenance and control of the systems, necessary for the waste management in consistence with the design requirements;
- management of record, control and archive of the documentation on RW management and utilized facilities;
- increase of safety culture and qualification of the personnel;
- development and application of internal documents (procedures, instructions and methods) on provision of safety and radiation protection of RW management;
- control of compliance of the RW management activities with the safety and radiation protection requirements.

The quality assurance program for RW management shall define the following:

- the organization of the RW management activities, personnel training and qualification, documentation control;
- the control measures for design implementation and control of design modifications, assessment of detected detriments, performed repair activities, and analysis of events and equipment failures;
- the measures upon detection of inconsistencies with the nuclear safety and radiation protection requirements;
- the measures for final product control and testing;
- the scope and procedures for radiation control, and the controlled radiation parameters;
- the scope and procedures for registration and archiving of the RW main characteristics.

The inspection of the implementation of quality assurance system is performed not less than once per year by a commission, appointed by the manager of the RW management organization.

The regulation on Issuance of Licenses and Permits for Safe Usage of Nuclear Energy describes in details the requirements for QAP presentation together with the applications for the various permits and licenses.

Quality assurance programs of the operating organizations

Quality assurance at Kozloduy NPP

The quality assurance system at Kozloduy NPP has been developed in compliance with the requirements of the Bulgarian nuclear legislation and the IAEA documents 50-C/SG-Q on quality assurance for nuclear installations safety. The requirements of BDS EN ISO 9001:2000 for quality management systems, with consideration of the environmental management requirements, have been included.

The quality management system is documented by:

- Quality and safety declaration;
- Quality Management Manual of "NPP Kozloduy" EAD
- Management documents (rules, manuals, instructions on quality and programs for execution of main activities in Kozloduy NPP Plc;

- Work documents, describing the execution order of separate activities (instructions, technologies, methods, procedures);
- Quality records, reflecting the results of the performed activity (protocols, acts, records, reports, forms, journals).

In fulfillment of the new regulations, enacted in 2004, and with the NRA, recommendations, the following QA documents for RW and SF management at Kozloduy NPP, have been updated:

- Complex program for management of RW from Kozloduy NPP– edition 2005
- Quality assurance program for SFSF safe operation.

The following QA documents are currently being developed:

- New edition of the Quality Management Manual of Kozloduy NPP;
- Safety Instruction on the fulfillment of the Kozloduy NPP's obligations as an operating organization in the meaning of ASUNE;
- Instruction on contracts.

Forthcoming is the preparation of:

- Records management procedure;
- Procedure for corrective and preventive actions;
- Procedure for management of nonconforming product

Quality assurance at the BAS Institute for Nuclear Research and Nuclear Energy

The quality management system, existing in INRNE at the time of the compilation of the First National Report, has been transformed into Integrated Management System, certified according to the ISO 9001:2000 и ISO 14001:1996 standards. The documentation structure includes the following document types:

- Documented declaration for policy and goals for quality, environmental protection and nuclear safety;
- Management system manual;
- Procedures;
- Instructions;
- Forms and records.

The Management System Manual reflects the requirements of the Bulgarian nuclear legislature as well as those of the IAEA documents 50-C/SG-Q for quality assurance of nuclear facilities safety.

Quality assurance at SC "RW"

During the SC "RW" structuring process and in particular for incorporation of the SU "RW – Kozloduy" in the company structure, the existing QMS of the Specialized Unit is being adapted to the basic QMS procedures of the SE. The quality system documents of the Specialized Unit are structured in accordance with IAEA recommended document, Quality Assurance for Safety in Nuclear Power Plants and Other Nuclear Installations: Code and Safety Guides Q1-Q14, Safety Series No. 50-C/SG-Q, IAEA, Vienna (1996) are applied.

The other radioactive waste management facility, PRRW "Novi Han", is currently in the process of incorporation into the SC "RW" structure.

The three QMS are in the process of mutual adjustment and modification toward a joint system of SC "RW".

The documents describing the process of quality assurance for RW management are:

- Quality Manual of the State EnterpriSC "RW";
- Quality assurance program for RW Management facility operation at Kozloduy NPP;
- Quality assurance program for RW transportation to PRRW "Novi han";
- Quality assurance program for RW storage at PRRW "Novi han";
- Quality assurance program for PRRW "Novi han" radiation protection;
- Quality assurance system for Monitoring of PRRW "Novi han";
- Environmental management program for PRRW "Novi han".

Quality assurance at SU "RW – Kozloduy"

QAPs have been developed in compliance with the national normative requirements and the IAEA recommendations.

A QAP for operation of the SU "RW – Kozloduy" facility has been developed. During its development, the requirements of the IAEA standard series 50-C/SG-Q, BDS EN ISO 9001:2000 for quality assurance system, ISO 10006 for project management and of ISO 14000:2000 for environmental management were adhered to. The basic principles of RW management, according to the IAEA documents and the available international recommendations and good practices, are also described.

In fulfillment of the transitional conditions of the operation license for the RW management facility, concerning the integration of the quality management system (QMS) to the QMS of the Head Department of SC "RW", including review and update of the SU "RW – Kozloduy" control documents, the operation QAP of the RW management facility at Kozloduy NPP, is currently being updated.

A program for quality assurance of reinforced container manufacture has been developed. The control of the manufacturing and technology during the RCC production is performed according to ON 0185755/92 and BDS 10474/72. The necessary technical documentation – formwork and reinforcement layouts, concrete design – has been completed. All materials, utilized in the manufacture of the RCC, are subject of qualification, aiming at establishing their conformance with the standards, given in the design documentation. The qualification results are documented with certificates and protocols. The conformance with RCC manufacturing technology is tested periodically in accordance with the manufacture QAP and following approved by NRA methodology.

Quality Assurance in PRRW "Novi han"

The building of an integrated system for quality and environmental management continues. The system conforms to the international standards EN ISO 9001:2000, EN ISO 14001:1996 and Safety Series №.50-C/SG-Q. 166 documents from a total of 216 QMS documents are presently ready.

The organization processes are defined and documented in 32 procedures reflecting all activities in the radioactive waste repository.

The quality manual reflects the organization policy for provision of nuclear safety and radiation protection through assurance of high quality of all activities and levels in the hierarchy. The system of authorization and responsibility assignment at all management levels is presented.

The activities are dealt with in their technological order in documents at the next document structure level – instructions, programs and rules, reflecting the legal requirements for the respective activity safety assurance and radiation protection of RW management. The prepared document undergo three-stage control – check for conformance with quality standards, for adequacy with the activity treated in the document and for connection to preceding or succeeding process or activity.

The reconstruction and modernization of the storage facility are priorities of the department of Projects and Technological Support Planning and Management, which are described in the procedures "Planning of processes for execution" and "Product design and development", containing description of the planning and design process, the measures for project implementation control and the performed changes, evaluation of the detected discrepancies and analysis of equipment events and failures.

The suppliers of materials and services are evaluated and classified according to predefined criteria.

The management of the resources and monitoring means are described in separate procedures, thus guaranteeing reliable engineering support of the systems of high importance for the safe storage operation. The technical means for radiation control undergo mandatory metrological control, performed according to approved annual schedule, with the checking results preserved according to the procedure for records management.

The main activity of receiving and storing of radioactive waste is governed by 40 internal documents, describing the conformance criteria for RW acceptance, RW transportation and entry control, marking and storage of RW at the "Novi han" territory.

The facilities and the legally defined zones are subject of constant radiological monitoring; the measured parameters are statistically processed and the information is published twice per year in bulletins. The values and the admissible deviations of the controlled radiation parameters for normal operation and emergency are analyzed and corrective or preventive measures are taken. The scope of the radiological monitoring procedures is consistent with the qualification of the PRRW personnel, which, for every job position, is trained in accordance with the job description. The training scope and form are consistent with the *Regulation of the conditions and procedure for acquiring professional qualification and for the procedure for issuing licenses for specialized training and certificates for qualification for use of nuclear energy.*

ARTICLE 24. OPERATIONAL RADIATION PROTECTION

"1. Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility:

(i) the radiation exposure of the workers and the public caused by the facility shall be kept as low as reasonably achievable, economic and social factors being taken into account;

(ii) no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection; and

(iii) measures are taken to prevent unplanned and uncontrolled releases of radioactive materials into the environment.

2. Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited:

(i) to keep exposure to radiation as low as reasonably achievable, economic and social factors being taken into account; and

(ii) so that no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection.

3. Each Contracting Party shall take appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility, in the event that an unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to control the release and mitigate its effects."

Review of the information, presented within the frame of the First National Report

The First National Report presents the basic ASUNE requirements for radiation protection, including the legal obligations of the licensees in case of emergency. The *Regulation on Basic Norms for Radiation Protection* from 2000 have been presented as well as the established radiation exposure limits for the population and the personnel.

The First National Report contains information on the mechanism for establishment of release limits for normal and emergency conditions.

The structure of the national regulatory and control authorities together with their rights and functions has been presented. The internal radiation protection structures of the main SF and RW management facilities operators, i.e. Kozloduy NPP and INRNE, have also been described.

The First National Report contains information on the licensees' networks for radiological monitoring of the environment as well as information on the monitoring conducted by the central state institutions. Information on the main operators' personnel exposure, on the nuclear facilities releases and on the radiological impact of the main facilities to the population is also presented.

Main radiation protection requirements

The main radiation protection principles and requirements are defined in ASUNE and the *Regulation for the basic norms for radiation protection (BNRP-2004)*. The main principles are consistent with the internationally accepted ones – justification, optimization, and limitation of the exposure. BNRP-2004 completely conforms to the requirements of the European Commission 96/29 Euroatom Directive and to the ICRP 60 recommendations. The dose limits defined in BNRP are as follows:

- The effective dose limit for the personnel is 100 mSv for the duration of 5 successive years, with the maximum effective dose for each year not exceeding 50 mSv;
- The limits of the annual equivalent doses with compliance with the effective dose limits are: 150 mSv for the eye lens; 500 mSv for skin (this limit applies to the average dose, received by every surface of 1cm^2 area, regardless of the area of the irradiated surface); 500 mSv for forearms, feet and ankles.
- Additionally introduced are the requirements that, in case of irradiation of pregnant women, the fetus or unborn infant shall be protected like a person from the population, and that the possibility of radiation contamination of the mother shall be excluded.

BNRP defines the following dose limits for the population irradiation:

- The annual effective dose limit per person from the population, is 1 mSv;
- Annual effective dose of 5 mSv may be allowed only in extraordinary conditions and provided that the average dose for 5 successive years does not exceed 1 mSv;
- The limits of the annual equivalent doses with compliance with the effective dose limits are as follows: for eye lens – 15 mSv, for skin – 50 mSv (this limit applies to the average

dose, received by every surface of 1cm^2 area, regardless of the area of the irradiated surface).

The newly adopted Health Act determines additional requirements for protection of the individuals from the effects of the ionizing radiation and specifies the organization and execution of the state health control for compliance with these requirements. The act provides a possibility for authorization of voluntary emergency exposure over the established in the BNRP dose limits in the case when this is necessary for rescue of human life or for prevention of greater exposure.

Dose constraints

BNRP – 2004 introduces the quota principle for radiation exposure of the population from different sources. For the purpose of the optimization of radiation protection and in addition to basic dose limits, defined in the BNRP, dose constraints are defined in the specific for the respective activity normative acts. The *Regulation for providing the safety of nuclear power plants* defines the following dose constraints:

- In all NPP internal operational conditions, the annual individual effective dose of population from internal and external exposure, caused by the impact of the liquid and gaseous releases in the environment from all nuclear facility situated on one NPP site, shall not exceed 0.15 mSv for new facilities, and 0.25 mSv for the existing facilities;
- The annual individual effective dose of population from internal and external exposure at the boundary of the radiation protection zone and behind it, shall not exceed 5 mSv for new facilities and 50 mSv for the existing facilities, during the first year after a design basis accident.

Respectively the *Regulation for Safety of RW Management* introduces the following dose constraints for new facilities:

- The annual individual effective dose for the respective critical population group, resulting from the operation of one or more RW management facilities, located within one site, may not exceed 0.3 mSv;
- The annual individual effective dose for the respective critical population group, due to design basis accident of RW management facility may not exceed 5 mSv;
- The annual individual effective dose for the respective critical population group, caused by the existence of a RW disposal facility after its closure, may not exceed 0,3 mSv.

Operational experience

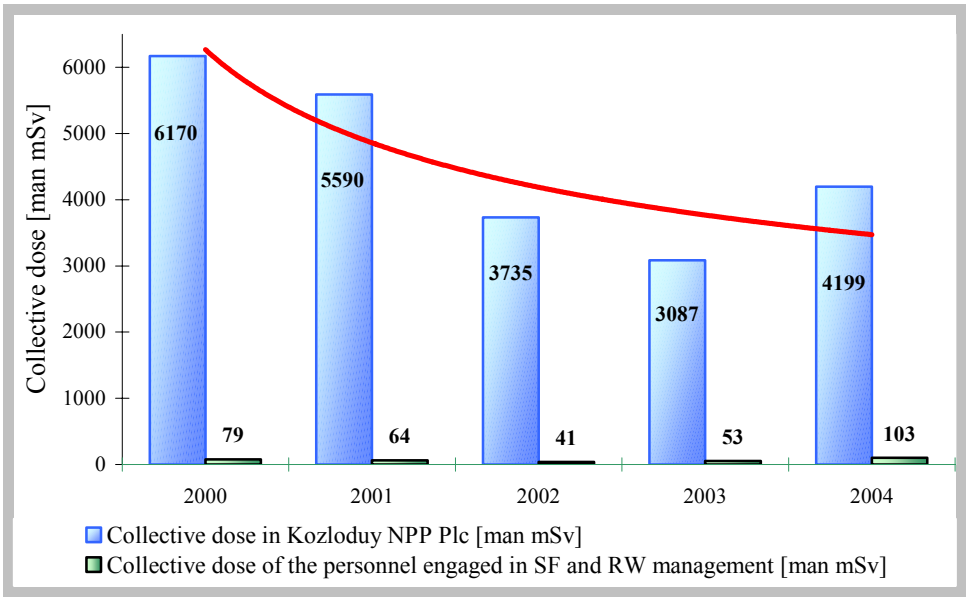
Occupational Doses at Kozloduy NPP / SC "RW"

Information on the professional exposure of the personnel, engaged in the RW and SF management in the period 2002 – 2004 is presented below:

Parameter	Year 2002			Year 2003			Year 2004.		
	RW	SFSF	NPP	RW	SFSF	NPP	RW	SFSF	NPP
Maximal annual individual dose [mSv]	0.68	1.20	19.62	1.86	1.67	18.21	5.98	1.94	19.93
Annual collective effective dose [man mSv]	34.55	6.72	3735	44.19	8.43	3087	93.39	9.47	4199
Number of persons, reaching the control level of 20 mSv	0	0	0	0	0	0	0	0	0
Average annual individual dose [mSv]	0.23	0.16	0.65	0.27	0.20	0.50	0.48	0.19	0.80
Internal exposure dose to collective dose ratio [%]	0	0	2.8	0	0.02	2.9	0	0.03	1.4

The collective effective dose of the engaged in RW and SF management personnel for 2004 was 102.9 man mSv representing 2.4% of the annual collective dose at Kozloduy NPP. The value is higher that the respective one for 2003 due to the executed in 2004 maintenance on the four units and safety upgrade of two of them. For comparison, no maintenance was performed of the fifth unit in 2003, and of the fourth in 2002.

Collective effective dose in Kozloduy NPP – EAD, 2000÷2004



Based on the presented information, the following conclusions on the exposure of the personnel, involved in the RW and SF management in Kozloduy NPP may be made:

1. The collective effective dose of the personnel, managing the RW and SF, depend on the scope of the executed maintenance activities in and follows the development trends of the professional exposure in Kozloduy NPP Plc from the last 5 years.
2. No intake of radionuclides was registered during work in the controlled zone of SU "RWRW – Kozloduy"; the collective dose from internal exposure in the SFSFF facility is negligible in comparison with the collective effective dose in Kozloduy NPP.
3. For the last five years, the maximal annual individual effective doze was between 0.68 mSv and 5.98 mSv, which represents 12% of the annual limit for professional exposure, specified by the BNRP regulation.
4. The average annual individual effective dose for the last three years is twice smaller than the average dose in Kozloduy NPP and does not exceed 0.48 mSv.
5. No normative and administrative limits for professional exposure were exceeded in the period 2002 – 2004.

The released through the Kozloduy NPP ventilation systems activity and the doses of the population due to the gaseous and aerosol releases in the period 2002 – 2004 are as follows:

Gas – aerosol releases	2002	2003	2004
Radioactive noble gases, TBq	267	253	71.5
Iodine-131, GBq	2.94	2.58	1.31
Radioactive aerosols, GBq	1.71	1.33	0.11
Collective effective dose [manSv]	$7{,}21.10^{-3}$	$5{,}28.10^{-3}$	$1{,}51.10^{-3}$
Individual effective dose [Sv]	$3{,}36.10^{-8}$ - $3{,}76.10^{-7}$	$1{,}76.10^{-8}$ - $3{,}07.10^{-7}$	$5{,}83.10^{-9}$ - $6{,}53.10^{-8}$

The 2004 discharges are significantly smaller than those in the preceding years and are under 1% of the technological norms for the site. The reasons for this reduction are the termination of operation of first and second units, the application of updated procedure for calculation and reporting of the results, as well as the systematic application of the ALARA principle in the every-day's activity of the plant.

The following service water quantities and activities were released into the Danube River in the period 2002-2004:

Year	2002	2003	2004
Volume, [m^3]	142 706	101 816	102 585
Activity, without tritium, GBq	*7,96*	*5,25*	*1,93*
Tritium activity, TBq	20,38	19,36	13,06
Collective dose [man.Sv]	$1{,}00.10^{-2}$	$9{,}73.10^{-3}$	$3{,}32.10^{-3}$
Individual effective dose [Sv]	$5{,}93.10^{-6}$	$5{,}64.10^{-6}$	$2{,}47.10^{-6}$

Since 2004 a program based on the EC-accepted CREAM methodology has been used for the calculation of the doses of the population within the 30-km zone and the doses of the critical group resulting from the liquid releases in the Danube River. All estimates for the stated period have been re-calculated with the said computer model.

The radioactivity, released from Kozloduy NPP with the gas-aerosol and the liquid emissions in the last years, is within the 1.6% of the norms, valid in the Republic of Bulgaria, and is comparable with the normal practice in other countries, operating WWER nuclear reactors.

The comparison of the estimates of the normalized collective effective dose of the population for Kozloduy NPP with the average value for a large number of PWR reactors shows complete consistence.

The estimates of the exposure dose of the population within the 30-km zone confirm the conclusion for negligibly small impact of the Kozloduy NPP operation on the environment and the population.

The releases from the SFSF and from the RW management facility of SU "RW – Kozloduy" are accounted for as a part of the NPP site releases. The population doses due to the operation of these facilities are included in the estimated total radiological impact on the population of all facilities on site. According to the assessments of the SAR for the RWPP, the contribution of the facility to the gaseous and aerosol releases from the site is less than 0.1% at full capacity of the facilities and lowered cleaning systems efficiency.

In compliance with the conditions of the license for operation of the nuclear facility for management of RW from Kozloduy NPP, the licensee must present at NRA periodic information about the releases from the facility. The fulfillment of this condition requires that a monitoring of the discharges from the facility be introduced and therefore a measurement system of the radionuclide composition of the aerosol releases is currently being installed.

PRRWRW "Novi Han"

The data for the doses of the PRRW personnel for the period 2000 – 2004, are given in the table:

Dose/Time	2002	2003	2004
Minimal individual dose, mSv/a	0.21	0.3	0.2
Maximal individual dose, mSv/a	2.12	1.93	2.84
Average individual dose, mSv/a	1.18	1.08	1.8
Number of persons with dose above 20 mSv/a	0	0	0
Annual collective effective dose, man mSv	67.26	61.57	102.6
Internal irradiation dose to collective dose, (%)	0	-	0

The collective dose of the PRRW "Novi Han" personnel in the year 2004 was 102.6 man mSv. The value is higher than those of the preceding years due to the larger scope of activities related to the management of sealed sources of higher activity on the PRRWRW "Novi Han" site, as well as to the dismantling and preparation for transportation of such sources.

Based on the presented information, the following conclusions on the professional exposure of the personnel, engaged in RWRW management, can be made:

1. The collective annual effective dose of the RW-managing personnel depends on the scope of the executed activities at the PRRW "Novi Han" site and at the sites of the RW generators.
2. No intake of radionuclide was registered during either work in the RW "Novi han" controlled zone, at receipt of RW at generator's site, RW transportation to PRRW "Novi Han" and participation in liquidation of emergency situation, related to radioactive sources, in the country.

3. The maximum annual effective dose in the last five years is between 1.93 mSv and 3.15 mSv, representing 3.86 to 6.3% of the annual limit for professional exposure according to the BNRP 2004.
4. No normative and administrative limits for professional exposure were exceeded in the period 2000 – 2004.

The analysis of the environmental monitoring results shows that the radiological impact of the facility is negligibly small.

ARTICLE 25. EMERGENCY PREPAREDNESS

"1. Each Contracting Party shall ensure that before and during operation of a spent fuel or radioactive waste management facility there are appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans should be tested at an appropriate frequency.

2. Each Contracting Party shall take the appropriate steps for the preparation and testing of emergency plans for its territory insofar as it is likely to be affected in the event of a radiological emergency at a spent fuel or radioactive waste management facility in the vicinity of its territory."

Review of the information, presented within the frame of the First National Report

The First National Report on the Joint Convention considers the ASUNE requirements for existence of internal and external emergency plans for nuclear facilities, their role in the licensing process, the created organization for emergency planning and preparedness on national level and the requirements for periodic checks and tests of the plans.

Information on the emergency planning, the emergency response at national level and the functions and tasks of the different institutions is presented. Information on the existing internal and external emergency plans, the emergency exercises, completed in 1996 – 2003 period and the country participation in the international projects on emergency planning is also presented.

Legislation changes, related to the emergency preparedness

During the period between the presentations of two reports, an analysis of the *Regulation on Emergency Planning and Emergency Preparedness for Action during Radiation Emergency* (adopted in 1998) was performed and the directions for amendments were determined. The analysis followed the IAEA recommendations, stated in the IAEA Safety Standard Series No. GS-R-2 "Preparedness and Response for Nuclear or Radiological Emergencies", as well as in other IAEA recommendation documents. The requirements of the EC Directive 89/618/Euratom from November 27, 1989, on informing the general public about health protection measures to be applied and steps to be taken in the event of a radiological emergency and of the Council Decision on Community arrangements for the early exchange of information in the event of a radiological emergency (87/600/Euratom), have been accounted for. The analysis results are utilized in the development of the new *Regulation for emergency planning and emergency preparedness in case of nuclear and radiological accident*.

The Regulation is applicable to all facilities, sites and practices, potential sources of radiological hazard, which are categorized in five threat categories depending on the possible gravity of the radiological consequences in the event of accident. The risk categories are:

1. Threat category I – nuclear facilities in which postulated initiating on-site events, including very low probability events, could lead to accident with significant release of radioactive substances to the environment and severe deterministic health effects off the site
2. Threat category II – site in which the on-site emergency events could lead to accident for which the projected dose could exceed the dose limits for the population off the site and implementation of urgent protective measures on site is required;

3. Threat category III – sites for which on-site emergency events could lead to accident for which the projected dose could exceed the dose limits for personnel and/or to contamination with radioactive substances on site that requires implementation of urgent protective measures;
4. Threat category IV – practices with sources of ionising radiation (SIR) that could lead to accident in a random or undetermined in advance place and the possibility that the projected dose could exceed the dose limits for general public for normal operation and to contamination of the environment with radioactive substances that could require implementation of urgent protective measures;
5. Threat category V – practices not involving SIR, but as a result of accident in threat categories I, II, III and IV or in case of transboundary release could lead to contamination with radioactive substances and possibility that the projected dose could exceed the dose limits for general public, determined for normal operation that could require implementation of protective measures.

The new *Regulation for emergency planning and emergency preparedness in case of nuclear and radiological accident* introduces the categorization of the radioactive sources and the activities with them corresponding to the recommendations of IAEA TECDOC-1344 "Categorization of Radioactive Sources".

In accordance with the regulation, a new classification of the accidents is introduced. Depending on the possibility for control of the processes during an accident and the severity of its consequences, the accidents fall under one of the following categories: "general emergency", "site area emergency", "facility emergency", and "alert".

Regulation for emergency planning and emergency preparedness in case of nuclear and radiological accident defines the principles, order and criteria for implementation of protective measures and activities for constraint, reduction and prevention of exposure or possibility of exposure and of harmful consequences to human health, life quality, property and environment from accident, chronic exposure or past practices. The intervention levels are defined as values of the projected dose and avertable dose for a certain time period, dose rate and specific activity, which, if reached, shall initiate the implementation of protective measures and analysis of the causes for achievement of these levels.

Emergency planning on and off the site

The new *Regulation for emergency planning and emergency preparedness in case of nuclear and radiological accident* defines detailed requirements for the on-site emergency plans of the licensees or permit holders.

The following emergency plans for the main SF and RW management facilities are presently in force:

1. On-site emergency plan of Kozloduy NPP, edition 2001, covering the on-site SF facilities (SFP, SFSF) and the SC "RW" facilities;
2. Plan for liquidation of the consequences and protection of the population and the environment from radiological accident during transport of spent fuel, 2001;
3. Emergency plan of Unit "Processing of RW", edition 2001";
4. Emergency plan of the INRNE – BAS research reactor, December 2001";
5. Emergency plan of PRRW "Novi han", January 2003";
6. Emergency plans of the facilities utilizing sources of ionizing radiation and generating RW (last editions in the period 1998 – 2004).

The emergency planning and preparedness off sites of the nuclear facilities are subject of off-site emergency plans, which are part of the National Plan for execution of rescue and urgent

emergency and restoration works in the event of disasters, accidents, and catastrophes. The last edition of the national emergency plan is dated 2004.

Emergency exercises and emergency drills

In compliance with the legal requirements, the licensees and permit holders periodically conduct emergency exercises and drills. The general full-scope emergency exercise and emergency drill for facilities and activities of risk categories I, II и III shall be conducted at least once per year under the observation of an authorized representative of the central authorities.

The last related RW management full-scope emergency exercise in Kozloduy NPP was conducted in 2001, on the topic of "Fire in RW storage facility". Exercise on the topic " Emergency with prolonged drying of SF assemblies in the SFSF" was conducted in December 2004.

In accordance with the adopted topical schedule, four emergency exercises were conducted in SU "RW–Kozloduy". Two emergency exercises on actions in the event of fire occurring, respectively on and off site, were completed in PRRW "Novi Han" in 2004.

The implementation of the off-site emergency plan shall be tested by emergency drills and full-scale emergency exercises, with the latter conducted at least once in five years. The last full-scale national exercise was conducted in 2002.

Bulgaria actively participates in the performance of international emergency exercises and drills for actions in the event of nuclear accident. In the period 2003 – 2005 the country took part in seven international emergency exercises and drills.

Besides these detailed practices are annually held. According to the thematic schedule a total of six training session were performed during the period. Their results are recorded in the logbook of emergency practices. In 2004, communication tests, for which NRA developed special form, were completed at national (about 50 tests) and international (5 tests) levels, with, by the 31.08.2005, the number of the performed communication tests reaching 60 and 7, respectively.

Regulatory inspections of emergency preparedness

The NRA exercises control over the emergency planning and preparedness of the nuclear facilities and the users of sources of ionizing radiation in accordance with the annual inspection plan. The type of control, as defined in ASUNE and described in the First National Report, are implemented at the different stages of activities execution – preventive, ongoing and follow-up control is applied. The applicability of the emergency plans is checked in practice during the emergency exercises and drills performance. In this manner, the fulfillment of the emergency preparedness requirements by the licensee is checked. The license is issued only after resolutions of the identified during the regulatory reviews and inspections issues (if any) on the on-site emergency plan.

The emergency plans of the licensees are developed on the basis of beyond design basis and severe accident analysis, which shall be approved by NRA in advance. The NRA review of this analysis includes a check for compliance with the dose limitations and with the decision making criteria for implementation of protective measures. The emergency plan review follows the procedure described below:

1. Check of the correspondence of the performed analysis to the initiating events, described in the emergency plan;
2. Check of the provided by the licensee justification on the sufficiency of the foreseen in the emergency plan resources and means for liquidation of the most severe possible accident and on the adequacy of the emergency response organization;

3. Check of the developed procedures and instructions for accident evaluation and protective measures implementation. The licensee must prove that these instructions are adequate, correct and in-time;
4. Check of the available equipment and working places of the emergency team members.

As a results of inspection of the readiness for routine operation of the RW management facility of SC "RW", SU "RW – Kozloduy", a transitional condition for updating the emergency plan in accordance with the inspection findings, was included in the operating license. In result of an inspection of the preparation for licensing of PRRW "Novi Han", guidelines for establishment of compliance with the *Regulation for emergency planning and emergency preparedness in case of nuclear and radiological accident* were given.

ARTICLE 26. DECOMMISSIONING

"Each Contracting Party shall take the appropriate steps to ensure the safety of decommissioning of a nuclear facility. Such steps shall ensure that:

(i) qualified staff and adequate financial resources are available;

(ii) the provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied;

(iii) the provisions of Article 25 with respect to emergency preparedness are applied; and

(iv) records of information important to decommissioning are kept."

Review of the information, presented within the frame of the First National Report

The First National Report presents the basic requirements of the ASUNE and the applicable at that time *Regulation No. 10 on decommissioning of nuclear facilities*.

The undertaken measures, concerning the decommissioning of units 1 and 2 of Kozloduy NPP are presented in the First National Report, Annex L-12

Regulation of Decommissioning

The *Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy* from 2004 contains the requirements on the licensing process and license application documentation, including the requirements about the structure and contents of the decommissioning plan. The final plan for a nuclear facility decommissioning is submitted to the NRA chairman at least 3 years prior to the start of facility decommissioning. The plan contains description and justification of the measures, ensuring the nuclear facility safety, during the decommissioning, such as the availability of sufficient and sufficiently qualified personnel, radiation protection concept, radiation monitoring programs, plant emergency plan, assessment of the necessary financial resources and information on the sources of funding, etc

Regulation for safety of the decommissioning of nuclear facilities was enforced in 2004, as part of the package of regulations for ASUNE application. This regulation contains more of the requirements of the superseded regulation on the *Act on the Use of Atomic Energy for Peaceful Purposes*, discussed in detail in the first national report on the Convention. The regulations in this document include requirements about early planning of the decommissioning and requirements on the safe decommissioning at the time of facility design, construction and operation.

In June 2005 NRA performed an inspection on the organization, planning and performance of activities for the preparation of units 1 and 2 of Kozloduy NNP for decommissioning. A delay of the planned activities, due to insufficient coordination between the different organizational units performing the planning process for decommissioning and the preliminary activities for unit

preparation was found. As result of the inspection, the NRA undertook measures for closer monitoring of the preparation for decommissioning.

Decommissioning funding

The decommissioning funding is defined in the frame of the national legislation by the ASUNE, which defines the establishment of the Nuclear Facility Decommissioning Fund, managed by the Minister of Energy and Energy Resources. A new *Regulation for the procedure for assessment, collection, spending and control of the financial resources and definition of the amount of contributions due on the Nuclear Facilities Decommissioning Fund* was issued in December 2003. This regulation superseded the regulation from 1999, described in the first national report.

The Fund incomes are formed by nuclear facility operator installments, by government budget resources, etc. The accumulated funds are spent solely for financing of projects and activities for nuclear facilities decommissioning.

The forecast of the required resources for Kozloduy NPP decommissioning activities is updated on three-year basis. The last forecast of these resources from 31 May this year is 5.2 billions BNL (about 2.6 billions EUR). This assessment includes the decommissioning expenses of all six Kozloduy NPP units, site decontamination and the management of the spent fuel, which will remain on the site after the sixth unit shut down. Based on this assessment, the NPP annual installment to the Nuclear Facilities Decommissioning Fund was established, which currently is 15 % of the NPP annual income from electricity sales.

Information on Nuclear Facilities Decommissioning Fund resources by years:

Year	Installment, in thousands BGN	Expenses, in thousands BGN	Availability, in thousands BGN
1999	552 200	21 858	530 341,63
2000	66 529 463	75 583	66 984 221
2001	101 972 530	1 797 011	167 159 740
2002	114 915 995	2 234 444	292 398 197
2003	157 292 123	1 997 363	447 692 956
2004	114 979 069	1 167 339	561 504 686
By 30.06.2005	65 079 591	193 327	**613 834 046**
Total:	**621 320 971**	**7 486 925**	

In addition to the Nuclear Facilities Decommissioning Fund, Kozloduy NPP decommissioning activities are financed by the International Kozloduy Decommissioning Support Fund. Up to this moment, projects with a total value of 65.196 millions EUR have been approved.

Decommissioning plans

The decommissioning planning for units 1 and 2 of Kozloduy NPP is most advanced, compared to the other units. The operation of units 1 and 2 was stopped in the year 2002 and they are currently maintained in an operating state, characterized by the lack of fuel in the reactor core. Technical design for decommissioning of units 1 and 2 was completed at the end of year 2001. A detailed description of the project was presented in the first National Report on the Joint Convention. At the end of year 2004 the technical design was updated. The main change was the extension of the post-operation period until the commissioning of the dry spent fuel storage, currently planned for 2009. In compliance with the requirements of the Bulgarian regulations and

the transitional conditions of the licenses for operation of units 1 and 2, Kozloduy NPP is developing a plan for the decommissioning of units 1 and 2. The deadline for the plan preparation, according to the license conditions, is 31.12.2005.

The Kozloduy NPP organizational arrangements for planning of the decommissioning activities and assistance of the relevant project management were described in the First National Report.

A database for management of decommissioning activities in units 1 and 2 of Kozloduy NPP was developed in the frames of IAEA project BUL/4/008. The database will assist in storage of important decommissioning information and the upload of the necessary data has already started since the system commissioning in March 2005.

The decommissioning of the research reactor IRT-2000 is treated by a preliminary decommissioning plan developed in 2005, within the project for reconstruction of the reactor. The regulatory body will review the plan in the frame of the licensing process of the reconstruction.

SECTION G. SAFETY OF SPENT FUEL MANAGEMENT

ARTICLE 4. GENERAL SAFETY REQUIREMENTS

"Each Contracting Party shall take the appropriate steps to ensure that at all stages of spent fuel management, individuals, society and the environment are adequately protected against radiological hazards.

In so doing, each Contracting Party shall take the appropriate steps to:

(i) ensure that criticality and removal of residual heat generated during spent fuel management are adequately addressed;

(ii) ensure that the generation of radioactive waste associated with spent fuel management is kept to the minimum practicable, consistent with the type of fuel cycle policy adopted;

(iii) take into account interdependencies among the different steps in spent fuel management;

(iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;

(v) take into account the biological, chemical and other hazards that may be associated with spent fuel management;

(vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;

(vii) aim to avoid imposing undue burdens on future generations."

Review of the information, presented within the frame of the First National Report

It was specified, that the main safety requirements for spent fuel management were defined in the ASUNE and the applicable regulations.

The main requirements of the ASUNE, relevant to ALARA principle and the protection of life, health and future generation's life conditions, have been described. It was specified, that the licensees shall perform safety assessments and to undertake activities and measures, considering the up-to-date scientific achievements, the national and international operation experience.

A detailed discussion was performed for the requirements of *Regulation № 3 on nuclear power plant design, building and operation safety* and *Regulation № 11 on the spent fuel storage safety*, with the purpose of systematic presentation of the technical requirements concerning facilities for spent fuel management.

Description has been made of Part six of the *Act of Environmental Protection*, which regulates the of environmental impact assessment (EIA) of investment proposals, related to spent fuel management. During the environmental impact assessment, the biological, chemical and other risks, which can be related to the spent fuel management, are considered.

The measures, which the Republic of Bulgaria provides to ensure reduction of radiation loads on the Kozloduy NPP site, and to avoid imposing a undue burden on future generations, were discussed.

Legislation changes, related to the general safety requirements

The issue of new regulations for the application of ASUNE, finalized the development of the legislative system, defining the general requirements on the safety of spent fuel management. The main documents in this relation are:

- *Regulation for providing the safety of spent nuclear fuel management;*

- *Regulation for providing the safety of nuclear power plants;*
- *Regulation on providing the safety of research nuclear installations.*

In 2003 the *Regulation on the conditions and procedure for implementation of environmental impact assessment of investment proposals for construction, activities and technologies* was issued, in accordance with the *Act of environmental protection*.

Provisions for subcriticality and residual heat removal

The main requirements to the subcriticality assurance and residual heat removal in the facilities for spent fuel control are defined in Chapter 3 of the *Regulation for providing the safety of spent nuclear fuel management*.

The implementation of the main safety functions - subcriticality and residual heat removal, is ensured by the design of the SF management facility. The control over the implementation of the safety functions is provided by the operator during all spent fuel management activities, both in normal operation mode of the facility or in the case of design-basis accidents.

The subcriticality in normal operation mode and during design-based accidents is ensured by the maximal effective factor for neutron multiplication 0.95. The subcriticality is ensured basically by: limitation of the grid step in the SF storage racks; control of the spent fuel assemblies disposition; limitation of possible transposition during transportation on the site, handling and storage of spent fuel during normal operation and at the time of external impacts. The spent fuel burnup can be used as nuclear safety justification parameter, only if the input spent fuel burnup is measured by technical means.

The spent fuel management design provides both technical means and organizational measures that exclude the possibility for spent fuel cladding temperature to increase over the design limits during normal operation and in the case of design-basis accidents. The design provides the function of cooling of the structure materials of the SF management facility within the design limits during normal operation and in the case of design-basis accidents, as well as the redundancy of the systems for the forced spent fuel cooling.

The design should provide measures for assurance of subcriticality and reliable spent fuel cooling in case of fires and mitigation of the consequences of fires.

If racks and containers are used, containing non-extractable neutron absorbing elements in the composition of their constructional elements, the grid step is related to the absorbing capacity of the elements. The use of extractable absorbing elements of neutrons in the racks and containers constructional elements is forbidden. Racks and containers, containing absorbing elements of neutrons in the composition of their constructional elements, shall be designed, fabricated and checked in that way so that unacceptable reduction of the absorbing ability under mechanical, chemical or radiation impact is avoided both in normal operation mode and in the case of design-basis accidents. The maximum allowed value of the absorbing capacity of the neutron absorbers is established in the design documentation.

The regulation defines the specific requirements for the implementation of the main safety functions of the spent fuel storage under water or in a dry storage.

SF generated from the operation of power units or research reactors is stored on the reactor site. For that reason safety regulations for Nuclear Power Plants and Research Nuclear Installations define respective requirements for spent fuel residual heat removal and maintenance of subcriticality of fuel storage outside of the core.

Minimizing the RW

The ASUNE regulates that the operator has the basic responsibility for establishing such conditions, that the volume and the radiation of the generated RW shall be as low as possible. The regulations providing for the safety of the spent fuel, generated by nuclear power plants and research reactors, require such design of RW storage technological processes and RW preliminary treatment, that the RW quantity to be minimal. The design shall provide limitation of the volume and the activity of the liquid RW to reasonably achievable level by:

- efficient decontamination and multiple use of the contaminated fluids;
- prevention of leakage from systems containing radioactive fluids;
- reduction of the frequency of the events, which require considerable decontamination measures.

The RW management systems are designed to take into account the requirements for safe management of RW during the life cycle of the facility.

A principle for minimization of RW generated from the spent fuel management is established in the *Strategy for Spent Fuel and Radioactive Waste Management*, approved by the Council of Ministers in 2004.

Consideration on the interdependency of the different stages of spent fuel management

The *Strategy for Spent Fuel and Radioactive Waste Management* from 2004 discusses the different stages of spent fuel management and analyzes in detail the different variants of SF storage and SF processing. The analysis considers factors, related to safety, environmental protection, funding, and disposal of the processed RW, etc.

The safety regulations define requirements for the design, in order to ensure the ability of spent fuel extraction for transportation, processing and disposal during any moment of the facility operation. The nuclear power plant operator and nuclear research installation operator are obliged to maintain adequate mode of spent fuel storage in the at-reactor SF pond, in order to ensure the ability for delivering fuel to processing or storage.

Protection of persons, society and the environment

The ALARA principle application is regulated in article 3 of ASUNE, and it requires that during the spent fuel management the personnel and public dose levels should be as low as reasonably achieved.

In compliance with the *Regulation for providing the safety of spent nuclear fuel management*, the effective protection of the personnel, public and environment is ensured by the application of the principle of defense in-depth, by a system of physical barriers on the spread paths of ionizing radiation to the environment and by a system of technical and organizational measures to protect the barriers and to preserve their effectiveness. A conservative approach is used during barrier and protection level development. The established organizational measures for the defense in-depth concept, as well as fulfilling the principles, achieving the goals, and meeting the safety criteria are documented by a safety analysis report (SAR).

In all operational states of the SF management facility the annual individual effective dose from internal and external exposure of the public, due to the liquid and the gaseous releases into the environment from all nuclear facilities on the site, shall not exceed 0.15 mSv. The annual individual effective dose from internal and external exposure of the public on the border of the radiation protected zone and outside shall not exceed 5 mSv during the first year after design-basis accident. In the case of severe accident, when there is no need for long term restriction of soil and water use,

the release limit of cesium-137 in the atmosphere is 30 TBq. Three months after the accident, a combined release of other radionuclides, different from cesium isotopes, shall not induce risk, higher than the one, established for cesium in long term. The frequency of large releases in the environment, for which emergency protective measures for the public have to be taken, shall not exceed 1.10^{-6} events for a facility per year.

The spent fuel management facilities impact on environment is obtained within the procedure for the environmental impact assessment for the cases, established in the *Act for environmental protection*. The conditions and the order of performing the environmental impact assessment, including the post control are defined in the *Regulation on the conditions and procedure for implementation of environmental impact assessment of investment proposals for construction, activities and technologies*.

Biological, chemical and other risks

In general the SF management does not bring substantial biological, chemical or other conventional risk. The assessment of this kind of risk is performed by the EIA, which is applied in this case, as in any other commercial activity.

Future generation protection

The protection of life, health and life conditions of the future generations is the basic principle, established in the ASUNE. The licensees shall perform safety assessment and to undertake activities and measures, according to the current scientific achievements, the own and the international experience.

In compliance with the *Regulation for providing the safety of spent nuclear fuel management*, the operating organization plans and performs periodic and systematic facility safety assessment, radiation impact assessment on the environment at certain well-founded periods during the designed facility lifetime and to assure safe operation at safety level, according to the applicable regulation requirements. The assessment period cannot exceed 10 years.

Preventing the undue burden on future generations

A number of legislative and regulation measures are issued, with the purpose to avoid the undue burden on the future generations. The ASUNE provides nuclear facilities license to be issued only to legal entities, possessing enough financial, technical, material resources and organizational structure, including for decommissioning of the facility. The safe decommissioning funding assurance is the basic obligation of the operator, according to the ASUNE. The necessary decommissioning financial resources are collected in the Nuclear Facilities Decommissioning Fund.

To prevent the undue burden on future generations is the basic principle in the *Strategy for Spent Fuel and Radioactive Waste Management*, approved by the Council of Ministers in 2004. Considering different variants for SF management, the Strategy establishes as most acceptable, from the viewpoint of protection of future generations, the variant of SF transportation for processing and returning back the RW for storage. A new SF dry storage is currently under design. It will be used to store high level RW after SF processing.

The SF, generated by the nuclear research reactor, is supposed to be transported to Russia in 2007-2008, according to a special joint project of IAEA, Russia and USA.

ARTICLE 5. EXISTING FACILITIES

"Each Contracting Party shall take the appropriate steps to review the safety of any spent fuel management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility."

Review of the information, presented within the frame of the First National Report

The existing SF storage facility is described. Information about the performed and planned assessments of the SFSF and storage pools safety is supplied. The planned IRT-2000 safety assessment, accounting for the planned reactor modernization, is discussed.

Legislation changes, related to the existing facilities safety reviews.

The existing facilities safety assessment is regulated in the national legislation as main requirement to extend the operation license, which term cannot be higher than 10 years. The transitional orders of the *Regulation for providing the safety of spent nuclear fuel management* regulate, that the regulation orders are applied respectively to any changes of the structures, systems and components, important to safety in the existing SF management facilities, which are commissioned before the regulation issue. In other cases, the regulation provisions are implemented as much as applicable for the existing SF management facilities, and the following dose limitations during normal operation, design- and beyond- design-basis accidents requirements shall be met:

1. the annual individual effective dose from internal and external exposure of the public, due to liquid and gas releases in the environment shall not exceed 0,25 mSv during all the operational states;
2. the annual individual effective dose from internal and external exposure of the public on the boundary of the protected zone and outside shall not exceed 50 mSv for the first year after the design-based accident;
3. the annual individual effective dose from internal and external exposure for the public on the boundary of the area for urgent protective measures shall not exceed 5 mSv for the first year after beyond design basis accident and shall not exceed 1 mSv annually for the following years.

The operators of SF management facilities, which are commissioned before the regulation is issued, shall fulfil the above requirements in two year after the regulation is issued.

Safety reviews and existing facility safety improvements

The *Safety analysis report of the SFSF* is completed in 2004. The main conclusions are that the SFSF safety, during normal operation and design-based accidents, is assured. It was performed "*Additional research and analysis of the possible loads of the SFSF structure for different load parameters and combinations"* The main conclusions are, that the structure and the foundation of the pools are assured against deformations, moving, cracks and tensions on the ground base in case of additional loads.

Based of the presented safety reports and analyses, the NRA issued operation license for SFSF, valid until year 2014.

During the period 2003-2005 the following safety improvement measures have been implemented in the SFSF:

- 160/32/8 t bridge crane control modernization;
- automatic measurement of the electrical conductivity of the water flows in SFSF;

- digital level meters of the SF storage pools;
- replacement of the equipment, which is not seismically qualified;
- radiation control system modernization;
- extended pool temperature control;
- tender for development and implementation of information system of the equipment state and the SFSF technological parameters;
- a contract for refueling machine is in process;
- a contract for replacement of protection and interlock system with digital one is in process.

Operation license requirements on safety reviews and on safety improvement of existing equipment

In the SFSF operating license, issued in 2004, are included the following conditions:

- Development and implementation of SFSF program for safety improvement, based on the inspection for compatibility with the requirements of the new regulation base and the applicable standards, in coordinated volume and terms with NRA.
- Development of SFSF safe operation technical specifications, including the established in the new Safety Analysis Report (SAR) limits and operation conditions and in accordance with the accepted international standards.
- Development of a program for long term reliable SFSF supply of cooling water, demineralised water, reagents, power supply and RW transport after units 3 and 4 decommissioning.
- Updating of all the operational, organizational and other documents, according to the new SAR and technical specifications.
- Development and implementation of a program for changes of the SFSF physical protection systems, considering the units 1 to 4 decommissioning.
- Development of plan for management of structures, systems and components ageing.
- Assessment of the remaining resource of the non-recoverable structures, systems and components.

ARTICLE 6. SITING OF PROPOSED FACILITIES

"1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed spent fuel management facility:

(i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime;

(ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment;

(iii) to make information on the safety of such a facility available to members of the public;

(iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.

2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 4."

Review of the information, presented within the frame of the First National Report

The requirements of the applicable regulations concerning SF management facility site selection are described. It was established, that the applicable AEP requires compulsory EIA for plans, programs and investment proposals in the constructions, activities and technologies or their changes, listed in Annex № 1 of the low, as the SF management facilities are included in the annex. The requirements of AEP, concerning the public discussion of the EIA results jointly with the community bodies and the authorized body, issuing the EIC decision, are presented.

The obligations of the environmental and water minister are listed, concerning the notification of other governments for investment proposals in constructions, activities and technologies on the territory of Bulgaria, assuming environmental impact on their territories

It is noted that Bulgaria is a state party to the *Convention of the EIA in trans-boundary context*. The agreements are listed, concerning the operational notification in case of nuclear accident and information interface, concerning nuclear facilities in neighboring countries.

Legislation changes, related to the site selection for proposed facilities

The main requirements to the SF management facility site selection are regulated in *Regulation for providing the safety of spent nuclear fuel management*, issued in 2004. During the SF management facility site selection the site characteristics, which can affect the facility safety have to be inspected and assessed, as well as the SF management facility impact on the public (current and future) and environment. The EIA is performed, according to the requirements of the Chapter 6 of the AEP.

The site shall be considered suitable for SF management facility if there is appropriate substantiation that, taking into account the site features, the operation of the facility will not result in exceeding the limits for radiation protection of the personnel and the public.

The applicant shall present the following documents together with the request for the site selection permit: *Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy*. They include:

- conceptual description of the nuclear facility, general characteristics and acceptance criteria of the sites;
- plan for preliminary studies;
- quality assurance program containing description of the general measures for site selection study, the methods for their execution and assessment, as well as a description of the document control and record keeping system.

The request for site selection permit is accompanied by preliminary SAR, containing the following data:

- comparison of the proposed sites, concerning the nuclear safety and radiation protection and selection of variant, considering the safety impact of the technogenic and natural factors on the facility; radiation impact on the public and the environment; the specific site characteristics, considering the migration and accumulating of radioactive substances; the availability of public protection measures in case of accident; the sizes of the zones of special statute and the emergency planning zones;
- the results of the research of the selected site characteristics, including: the geographic, topographic and demographic conditions; the technogenic factors, hydro-meteorological conditions; the geological, hydrological, seismic and engineering-geological conditions; specific characteristics of the site and the region concerning the emergency planning, emergency management and the physical protection;

- list of the references, used for site specific data and information;
- list of the persons, developed the documents and the site researches, as well as data about their qualifications.

Besides the preliminary report, the following documents are required:

- site monitoring programmes, including: seismic monitoring, regime of ground and surface waters and other natural phenomena monitoring;
- decision on the EIA;
- programme for additional research of the selected site, in case the SAR proves the necessity of such researches;

When it is foreseen that the nuclear facility shall be situated on the site of another nuclear facility, which is already constructed and commissioned, the possible influence over the proposed new nuclear facility and over the other nuclear facilities, situated on the same site shall be considered in the preliminary SAR.

As mentioned in the first national report, the AEP regulates the EIA, including the trans-boundary aspects of this assessment.

The order for performance of an EIA is regulated in the *Regulation on the conditions and procedure for implementation of environmental impact assessment of investment proposals for construction, activities and technologies,* issued in 2003. The body, authorized to make decisions on EIA is the minister of environment and water. The EIA decisions are based on the prepared EIA, the results of the public discussions and the compliance with the applicable legislation. The decision includes, if necessary, measures of reduction or avoiding negative environmental impacts, which are described in special plan and are mandatory to the investor/operator during the design, construction, operation and the decommissioning of the facility.

Issued permits for SF management facility site selection.

In 2003 the Kozloduy NPP applied for a site selection permit for dry SF storage facility. On 19.12.2003 the NRA chairman issued permit for site selection. In April 2004 the NRA chairman approved the selected site for storage building.

ARTICLE 7. DESIGN AND CONSTRUCTION OF FACILITIES

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

(i) the design and construction of a spent fuel management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a spent fuel management facility are taken into account;

(iii) the technologies incorporated in the design and construction of a spent fuel management facility is supported by experience, testing or analysis."

Review of the information, presented within the frame of the First National Report

Description of the requirements of the current regulations, concerning design and construction of SF management facilities is provided. It is noted, that the high quality level is obligation of all persons, performing activities on ASUNE. The requirements, concerning the preliminary planning of the decommissioning at the stage of design and construction are presented.

Legislation changes, related to the design and construction of facilities

The main requirements from the design and the construction of SF management facilities are regulated in the *Regulation for providing the safety of spent nuclear fuel management*, issued in 2004.

The regulation establishes in detail the requirements to the SF management facility design, including the specific technical requirements to the stand-alone SF management facilities, which technology is "under water" or "dry storage". According to the *Regulation for providing the safety of spent nuclear fuel management* the safety is ensured by:

- conservative approach in establishing the barriers and the protection levels;
- high quality of design, construction and equipment;
- implementation of technologies proved in the practice.

The Regulation requires development of preliminary SAR for storage, transport and handling, in case of normal operation and design-basis and beyond design-basis accidents. After facility construction, the SAR is updated, according to the current state of the facility. The lifetime of the facility and the equipment has to be defined and justified in the design. The SF management facility design has to include separate part on decommissioning.

The *Regulation for safety of the decommissioning of nuclear facilities,* issued in 2004, obligate the design and construction permit holder to develop preliminary concepts and plans for decommissioning. The concept discusses the following technical measures and decisions, facilitating the decommissioning activities:

- adequate equipment's, systems' and components' layout, as well as for equipment for decontamination, handling and remote control, according to the possibilities of easy dismantling and transport;
- construction materials, equipment and systems are selected and designed in such a way, that, the decontamination to be easy and to minimize the contamination and the spread of radioactive substances and generated RW, inclusively during the decommissioning.

The concept shall include preliminary analyses and assessments of the decommissioning impact on the public and the environment. For assuring of the decommissioning funding, the conception shall include:

- preliminary assessment of the necessary financial resources, defined on the basis of already implemented and approved decommissioning methods and technologies and cost-benefit assessments;
- how the necessary financial resources will be provided and managed, according to the regulatory framework.

Issued permits for the design of SF management facilities.

In August 2004 the Kozloduy NPP applied for a permit to design a dry SF storage facility. As the new *Regulation for safety of the decommissioning of nuclear facilities* and *Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy* were already enforced, for the first time were applied in full scope the new regulatory requirements. On 28.12.2004 the NRA chairman issued permit to the Kozloduy NPP, for designing of nuclear facility. According to the transitional conditions of the permit, in May 2005 "Detailed technical design content" was submitted to the NRA. The next documents to be submitted are: "Detailed SAR content" and "Technical order for independent verification of the intermediate SAR"

ARTICLE 8. ASSESSMENT OF SAFETY OF FACILITIES

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

(i) before construction of a spent fuel management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

(ii) before the operation of a spent fuel management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

Review of the information, presented within the frame of the First National Report

Description is presented of the requirements of the applicable regulations, concerning the safety assessment of the SF management facilities. It was noted that the safety assessment is basic obligation of the licensees and that the SF management facility design shall contain preliminary SAR. Information is presented, concerning the EIA.

Legislation changes, related to a facility safety assessment

Regulation for providing the safety of spent nuclear fuel management and *Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy*, issued in 2004, provide for systematic safety assessment and EIA that shall consider the risk posed by the operation of the SF management facility.

During the SF management facility site selection, the site characteristics that can impact safety have to be analyzed and assessed. As noted in the first national report, the SF management facility impact on the public (now and in the future) and on the environment shall be assessed according to the requirements of *Act on Environmental Protection*.

The SF management facility design has to contain preliminary SAR, which is updated according to the current state of the facility, after its construction. The SAR has to:

– contain technical and organizational measures;

– contain safety analysis and assessment;

– prove of the fulfillment of the basic safety functions;

– define the initiating event risk;

– demonstrate the achievement of the safety goals and criteria.

The SAR expresses the actual facility state during all the operation period and the decommissioning.

The application for the selected site approval has to be accomplished by the preliminary SAR. The requirements of the report contents are established in detail in the *Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy.* The most important are:

- general description and characteristics of the facility;
- the basic safety goals, principles and criteria, which are applied in the safety analysis;
- types and quantities of RW, expected to be produced as result of the operation of the facility, their management until their disposal or clearance by regulating control;
- comparison of the proposed sites, according to the nuclear safety and radiation protection and selection of variant;
- the results of the research of the characteristics of the selected site.

The EIA decision is attached to the application for the selected site approval. The authorized body, competent to assess the environment impact is the Minister of environment and waters. The assessment sequence is established in the *Regulation on the conditions and procedure for implementation of environmental impact assessment of investment proposals for construction, activities and technologies,* issued in 2003.

Intermediate SAR is attached to the application for the design approval. The intermediate SAR is based on the preliminary SAR and on the detailed design of the facility.

The final SAR, based on the intermediate report, in which the commissioning results are considered, is attached to the operation license request.

ARTICLE 9. OPERATION OF FACILITIES

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

(i) the license to operate a spent fuel management facility is based upon appropriate assessments as specified in Article 8 and is conditional on the completion of a commissioning program demonstrating that the facility, as constructed, is consistent with design and safety requirements;

(ii) operation limits and conditions derived from tests, operational experience and the assessments, as specified in Article 8, are defined and revised as necessary;

(iii) operation, maintenance, monitoring, inspection and testing of a spent fuel management facility are conducted in accordance with established procedures;

(iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a spent fuel management facility;

(v) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;

(vi) programs to collect and analyze relevant operating experience are established and that the results are acted upon, where appropriate;

(vii) decommissioning plans for a spent fuel management facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body.

Review of the information, presented within the frame of the First National Report

Information about the ASUNE requirements, concerning the nuclear facilities operation license issue is presented. Description of the requirements of the applicable regulations for commissioning and operation of the SF facility is provided.

It is stated that the technical specifications are the main documents, establishing the safe operation of the SF facility. They include the limits and conditions for safe operation and the general order of the performance of the operation, concerning the safety. The specifications are developed and updated by the licensee, according to the own and international operation experience.

Description is done of the ASUNE requirements concerning:

- existence of engineering and technical support in all the safety related areas, during the operation period;
- existence of technical resources and sufficient qualified and certified personnel during the operation period;
- safety related incident reporting;

- development and implementation of procedures for analysis of the own operation experience.
- performance of measures, facilitating the decommissioning activities.
- performance of periodical assessments and regulatory inspections.

Legislation changes, related to facilities operation

After the enforcement in 2004 of the *Regulation for providing the safety of spent nuclear fuel management*, *Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy* and *Regulation for safety of the decommissioning of nuclear facilities* the regulatory framework concerning the SF management operation was completed.

A commissioning programme has to be attached to the application for commissioning permit. This program establishes the stages of commissioning, the activities of every stage and the duration of every stage. The program contains the information to prove that:

- all necessary tests for confirmation of design characteristics specified in the intermediate SAR are envisaged;
- staged testing is planned that provides for gradual increase of the load over the facility;
- hold periods are envisaged, during which the facility shall be operated at certain conditions at preliminary defined intervals;
- list of the systems and the equipment, necessary for the different stages of commissioning, is prepared;

The operational technical specifications, attached to the permit application contain the limits and conditions of operation,

Before each commissioning stage, inspection team, assigned by the NRA chairman, checks the data and circumstances for correspondence with the previously declared by the operator. The inspection results are documented in the inspection report.

After the tests and experiments of each stage, protocols are written, containing:

- list of the performed stage activities;
- analysis of the compliance of the design characteristics with the real equipment characteristics confirmed by tests or experiments;
- description of the defects and failures;
- Analysis and conclusions about the reasons and the acceptability of the actual characteristic deviations from the design characteristics and measures for their elimination.

A nuclear facility operation license is issued after fulfilling all the conditions of the commissioning permit conditions, determined by NRA inspection team, assigned by NRA chairman order to check the applicant's documents and to perform the on-site inspection.

The application for nuclear facility operation license is accomplished with several documents, including:

- correction of the operating documents, attached to the application for commissioning permit, considering the commissioning results;
- operating procedures for systems and equipment important to safety;
- schedules and procedures for test and control of the systems important to safety;

- plan-schedule for maintenance and repair of the main equipment;
- rules, procedures and programs for training of the personnel and for improvement and control of its qualification;
- procedure of the report order and the analysis methods of the operating events;
- program for management of the equipment resource during the license term and during all the operation term including control of the state of safety important components;
- updated decommissioning plan.

The operating organization develops and applies indicators and operational safety assessment methodology, including the safety self-assessment programme, which contains assessment of the achieved safety level, compared with the planned safety level and particular tasks for safety improvement.

The operational technical specifications are developed, according to the facility design and the preliminary SAR and are updated after the commissioning, after design changes and after updating the safety analysis report.

The operating organization develops and applies a system for storing, processing and analysis of the information, concerning the facility operation, the state and failures of the systems and components and the human errors. The analysis results are considered systematically and are applied for improvement of the operational practice, personnel qualification and the optimization of the maintenance.

The development of the SF management facility decommissioning plans is discussed in Article 26 in Section F of the report.

Issued permits for SF management facility operation.

There is information about the license, issued in 2004, concerning the SFSF operation presented in Article 5 in this Section of the report.

ARTICLE 10. DISPOSAL OF SPENT FUEL

"If, pursuant to its own legislative and regulatory framework, a Contracting Party has designated spent fuel for disposal, the disposal of such spent fuel shall be in accordance with the obligations of Chapter 3 relating to the disposal of radioactive waste."

In compliance with the *Act on the safe use of nuclear energy* the Council of Ministers can declare spent fuel as radioactive waste under conditions, indicated in the act.

The *Strategy for Spent Fuel and Radioactive Waste Management*, adopted in 2004, does not envisage spent fuel disposal.

SECTION H. SAFETY OF RADIOACTIVE WASTE MANAGEMENT

ARTICLE 11. GENERAL SAFETY REQUIREMENTS

"Each Contracting Party shall take the appropriate steps to ensure that at all stages of radioactive waste management individuals, society and the environment are adequately protected against radiological and other hazards.

In so doing, each Contracting Party shall take the appropriate steps to:

(i) ensure that criticality and removal of residual heat generated during radioactive waste management are adequately addressed;

(ii) ensure that the generation of radioactive waste is kept to the minimum practicable;

(iii) take into account interdependencies among the different steps in radioactive waste management;

(iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;

(v) take into account the biological, chemical and other hazards that may be associated with radioactive waste management;

(vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;

(vii) aim to avoid imposing undue burdens on future generations."

Review of the information, presented within the frame of the First National Report

First National Report presented the legislation of that time pertinent to Article 11 of the Convention, i.e.: ASUNE, Act on Environmental Protection, Regulation № 7 from 1992, Regulation № 0-35 of the Ministry of Public Health and the Ministry of Interior from 1974 and the Regulation of the Basic Norms of Radiation Protection (BNRP-2000).

ASUNE provisions, concerning the maintenance of sub-criticality during RW management, the minimization of waste generation and the consideration of the inter-dependencies among the different stages of RW management were discussed. Some provisions of Regulation № 7 and requirements of other regulations were also discussed.

Legislation changes, related to safety

The basic legislative acts, establishing the general safety requirements during the main RW management activities, including processing, storage and disposal of RW are ASUNE, BNRP - 2004*, Regulation for safety of RW management* (see Article 19 of the report, "Legislative and Regulatory Framework"). Other regulations are also applicable to different aspects of the RW management, e.g. *Regulation for radiation protection during activities with sources of ionizing radiation* – concerning the clearance of material and *Regulation for providing the safety of nuclear power plants* – concerning the operating organization requirements.

Provision of sub criticality and residual heat removal

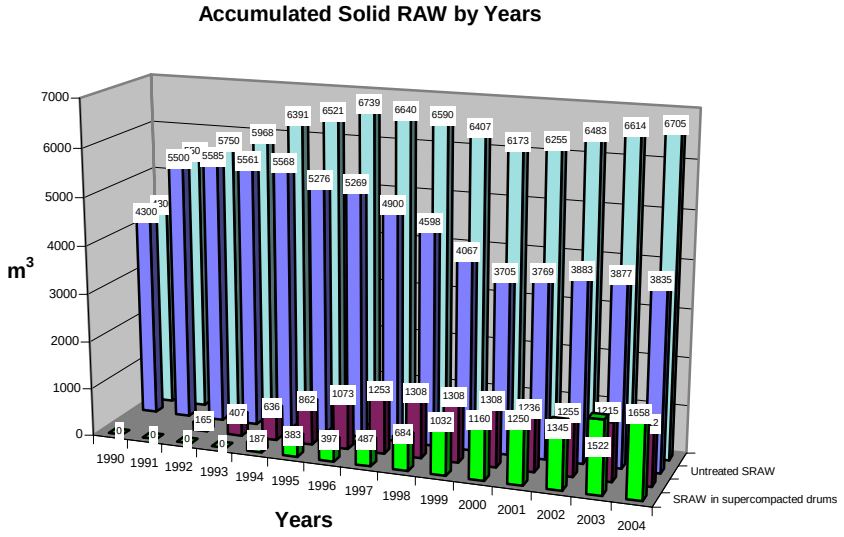
The *Regulation for safety of radioactive waste management* requires, when necessary, provision of sub-criticality and residual heat removal to be assessed within the safety assessments and to be considered during the facility design. In the case when RW represents a fissile material, the regulatory provisions described in Article 4 (i) are applied.

Since the generated in the country RW is low or intermediate level, practically no special measures are necessary to assure these safety aspects during their management.

Minimization of RW

The requirement for minimization of RW generation is established in the ASUNE and is further elaborated in the *Regulation for safety of RW management*. The Regulation makes a distinction between the minimization of the final volume of RW for disposal by implementation of RW processing techniques and the control of the raw waste generation at the source. With the purpose to minimize the RW generation and to avoid RW accumulation, the Regulation requires that:

- technologies and procedures, leading to minimal RW generation shall be applied;
- RW shall be segregated and sorted considering their characteristics and the foreseen further management methods;
- spread of contamination in the facilities shall be avoided;
- decontamination shall be executed on the basis of cost/benefit analysis ;
- technologies for RW volume reduction shall be applied;
- procedures for clearance of materials from regulating control shall be applied.



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
SRAW in supercompacted drums	0	0	0	0	187	383	397	487	684	1032	1160	1250	1345	1522	1658
Drums containing SRAW			165	407	636	862	1073	1253	1308	1308	1308	1236	1255	1215	1212
Untreated SRAW	4300	5500	5585	5561	5568	5276	5269	4900	4598	4067	3705	3769	3883	3877	3835
Total amount of SRAW in storages	4300	5500	5750	5968	6391	6521	6739	6640	6590	6407	6173	6255	6483	6614	6705

Clearance is an important mechanisms for minimization of the final RW volume to be disposed of and therefore levels for unconditional clearance were established in the *Regulation for radiation protection during activities with sources of ionizing radiation*. Development of regulatory guidance on the application of the clearance procedures is underway.

In result of the adopted by Kozloduy NPP measures for RW minimization the accumulation of solid RW in storage has practically stopped in the middle 90-ties. As evident from the above figure, the volume of stored solid unprocessed RW has been reduced, while the total amount of solid RW has been relatively constant for the last 10 years. This is due to the implementation of the RW processing technology, as well as due to the establishment of more stringent control on the material movement and the re-use of contaminated equipment.

Consideration on the interdependency of the different stages of RW management

The consideration of inter-dependencies among the different stages of RW management is one of the basic obligations of the persons generating or managing RW, according to the *Regulation for safety of RW management*. The Regulation requires that every stage of RW management shall facilitate the next stages and the methods, applied for RW processing shall guarantee the compatibility of the produced RW with the storage and disposal acceptance criteria. The regulation imposes obligation on RW generators to develop programs for RW management, covering all generated RW and all stages of their management. In the case where the waste management is performed by more than one person, the program shall be agreed between all persons, the responsibility always remaining within the waste generator. Such a program has been developed by Kozloduy NPP and agreed with SC "RW".

The *Regulation for the conditions and procedure for transfer of radioactive waste to the state enterprise "Radioactive Waste"* creates effective mechanism for consideration of the inter dependencies in the RW management under the conditions of different organizations, taking part in the different stages of RW management. The Regulation requires that the RW generators shall develop programs, containing technical specifications of the RW, schedule of delivery of the waste to the SE, descriptions of the measures for assurance of effective management and control of the waste from their generation to their delivery to the SE. The programs shall be submitted to the SE no later than 2 years before the waste delivery. The SC "RW" performs qualification of the RW to be accepted, to assure that during all stages of RW management technical and administrative measures for assurance of the compliance with the acceptance criteria are applied. The qualification can include review of the waste generation and management processes on the site of the waste generator.

Since Bulgaria does not have a repository for NPP radioactive waste during the management of these RW the provisions of the National Legislation as well as the requirements for long-term storage of waste packages are applied. During the selection of site and waste disposal technology, the features of the used packages, generated by the existing technology, will be considered. NRA has already approved technical specifications for those waste packages.

Protection of individuals, the society and the environment

The radiation protection during operation is discussed in the report on Article 24. The long-term aspects of the radiation protection during RW disposal are commented here.

The *Regulation for safety of RW management* imposes the following dose limitations in a long-term perspective:

1. annual individual effective dose for the corresponding critical group members of the public in result of the existence of a waste disposal facility after its closure (for normal evolution of the disposal system) shall not exceed 0.3 mSv ;

2. in case of low probability events and human activity on the waste repository site (human intrusion) after closure of the facility the established in the regulations intervention levels shall be applied.

The results of the last post closure safety assessment of the PRRW "Novi Han" in 2002 show that the predicted dose for the member of the general public is $5{,}83.10^{-7}$ Sv/a, which is considerably below the defined criterion (3.10^{-4} Sv/a). The results for the human intrusion scenarios indicate that intervention measures may be necessary on the sealed sources repository.

Following the requirements of the *Regulation for safety of RW management* safety of the disposal facilities, after their closure, must be fully assured by the engineered and the physical barriers. This means, that the discussed radiation protection criteria for the public shall be fulfilled

without human activities on the site. The Regulation requires that the design of a waste disposal facility shall define: the engineering and physical barriers together with their safety functions; the minimal period of time in which every barrier will perform its safety function and the necessary physical, chemical and mechanical properties of the barriers that guarantee the fulfillment of the above conditions. In the case of geological disposal the natural geological media shall provide for isolation of the radioactive substances from the biosphere and the public for no less that 10 000 years. In the case of near-surface disposal the period of time in which the barriers shall provide for waste isolation is not specified in regulation. Compliance with the long-term radiation protection criteria shall be demonstrated by assessment of the radiological impact for a time period enough to reach the maximum of the calculated dose.

Safety assessment deals with the radiological impact on the human assuming that if human is protected then adequate level of protection is provided to the other living species. The protection from other potential hazards that RW may cause to the environment is subject of EIA and further control by the ministry of the environment and waters.

Biological, chemical and other hazards

In general, the management of low and intermediate level NPP waste does not result in considerable biological, chemical or other conventional risk. In the cases where such RW are generated (for example in the medicine and scientific researches) the applied waste management procedures take it into account in accordance with the applicable regulatory requirements.

The assessment of these hazards is subject of EIA, applied in the same way, as for every other industrial activity.

Protection of future generations

The applicable dose limitations for the future generations, resulting from RW disposal, are not higher than the currently applicable. Their values are discussed above, as well as the mechanisms to achieve this level of protection.

Avoidance of the undue burden on the future generations

The new Bulgarian legislation is based on the principle of the avoidance of undue burdens on the future generation. This principle is developed in the requirement of the *Regulation for safety of RW management* concerning the duly processing of RW into a long-term safe form and timely disposal of the processed RW. The Regulation contains also requirements, concerning the post-closure control and monitoring for confirmation of the safety assessment results.

Understanding of the Bulgarian government of the importance of this principle led to the inclusion in the 2004 governmental *Strategy for Spent Fuel and Radioactive Waste Management* of a number of measures in this direction. The most important of them are the decision for construction of a national LILW disposal facility until 2014 and the initiation of preliminary study on disposal of high level and long lived RW. More detailed information about the planned activities for site selection of RW disposal facility is presented in the report under Article 13, and for the other planned measures – in the report, in part K.

ARTICLE 12. EXISTING FACILITIES AND PAST PRACTICES

"Each Contracting Party shall in due course take the appropriate steps to review:

(i) the safety of any radioactive waste management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all

reasonably practicable improvements are made to upgrade the safety of such a facility;

(ii) the results of past practices in order to determine whether any intervention is needed for reasons of radiation protection bearing in mind that the reduction in detriment resulting from the reduction in dose should be sufficient to justify the harm and the costs, including the social costs, of the intervention."

Existing facilities

The safety assessment of existing facilities is established in the national legislation as the main requirement for extension of the operating license, whose term can not be longer than 10 years.

The safety review of the RW management facilities at Kozloduy NPP is part of the performed in the frames of the licensing of the NPP units periodic safety evaluation. No safety issues relating to the waste management facilities of the plant have been identified during the last reviews. The planned measures are directed towards optimization of the RW management by implementation of new technologies and construction/installation of new facilities. These measures are described in Section K.

The last safety analysis report of the RWPP on the NPP site was issued in December 2004 and is reviewed by NRA, within the operating license issuance process. The assessment results prove that the radiological protection of the personnel and the public is guaranteed, during normal and accidental conditions, and the contribution of the facility to the exposure of the public from the NPP site is negligible. As result of the regulatory review transitional conditions in the operation license were formulated, containing a number of compulsory organizational and technical measures along with the terms of their implementation. Some of the transitional conditions consist in system modifications, included in "Schedule of units, details and new facilities implementation".

During the period from the first national report the following activities for RW management safety improvements in SC "RW", SU "RW-Kozloduy" were performed:

1. Technical solutions for technology improvements and safety enhancement were implemented on the basis of the liquid line commissioning experience.

2. Schedule of units, details and new facilities implementation was developed. The activities from the schedule are directed towards enhancement of the safety of the facility.

3. Technologies for filling of RCC with radioactive cement were developed and tested in practice.

4. Manufacture and testing of RCC has started.

5. The conditions for safe extraction of drainage concentrate from the auxiliary buildings of the NPP and transportation to the RWPP were established.

6. The main modules of an installation for decontamination of metal RW were delivered and prepared for assembly in the RWPP.

7. Technical specifications for operation of RWPP were developed and approved.

8. New internal documents of SU "RW-Kozloduy" were developed, concerning the radiation protection, the application of the ALARA principle, the radiation monitoring, access system, the physical protection, etc.

The last operational safety assessment of the PRRW "Novi Han", "Updated SAR", was submitted to NRA for review in June 2005 and is expecting regulatory consideration. It is expected that this assessment will demonstrate the achieved facility safety level after the 1997 – 2004 modernization and will serve as a basis for issuance of long-term operation license.

The following modernization measures were implemented in PRRW "Novi han", during the period from the previous national report:

1. Development and implementation of segregation approach to the storage of the RW, by the use of different storage units for the different incoming waste types;

2. Development and implementation of RW system for RW qualification on the site of RW the generator by implementation of modern portable instrumentation for waste characterization;

3. Development and implementation of incoming RW control system on the PRRW "Novi Han" site, by reconstruction of the acceptance unit and implementation of modern instrumentation for RW control and characterization;

4. Design and construction of decontamination unit for large vehicles;

5. Improvement the RW facility technological control system, including construction of monitoring wells near the sealed sources disposal facility;

6. Improvement of the radiological monitoring system on site;

7. Improvement of the system for individual dosimetric monitoring;

8. Additional improvement of the physical protection and facility security by construction of additional local security systems.

Past practices

RW from past practices are the waste from uranium mining and milling industry closed in 1992 and the sealed sources stored on the sites of bankrupted enterprises.

RW storage in bankrupted enterprises is not acceptable from safety. And security point of view and for that reason they are transferred to the PRRW through special programs. In 2004, with US government assistance, the improperly stored high-activity radioactive sources were collected and transferred to PRRW. In order to fulfil the requirements of the *Regulation for the conditions and procedure for transfer of radioactive waste to the state enterprise "Radioactive Waste"* the enterprise shall develop Special program for acceptance of waste from past practices, which shall cover all accumulated in the country RW of that type. Plan for development of the special program for acceptance of waste from past practices and List of potential facilities containing waste from past practices RW has been developed so far.

The uranium industry of Bulgaria operated more than 40 uranium ore mines and two milling plants. Over 20 million tones of waste were accumulated in 3 tailing ponds and about 300 solid waste banks. The uranium production was closed in 1992 with a government decree, and the recovery activities of the impacted areas started in 1998. The following biological rehabilitation projects were finalized: "Trakia – RM" EOOD – village of Momino; "Zlata" EOOD – Tran; "Georesurs" EOOD – Simitly; "Balkan" EOOD – village of Tzerovo; "Georedmet" EOOD – Buhovo. Projects for biological rehabilitation and environmental monitoring are at a different stage of tendering and implementation at the following sites: "Redki Metali" EOOD – Buhovo; "Geostroikomplekt" EOOD – village Kalekovec and "Podzemno stroitelstvo" EOOD – Sofia. Radiological environmental monitoring is performed at all facilities.

Bulgaria presents the following information, concerning the findings of the first review meeting of the Joint Convention for unsatisfactory quality of the release water for one of the tailing

ponds: This tailing pond is situated 1 km east from Buhovo and until 1992 supported the operation of "Metalurg" uranium mill. In 2001 a project for reconstruction of the pond was finalized, including reinforcement of the pond embankment and construction of facilities that would eliminate water infiltration in the tailings and the consequent release of contaminated water into the environment. In 2003a State Acceptance Commission found that the implementation of the second task (elimination of water infiltration) was unsatisfactory and water containing radionuclides with exceeding the admissible levels concentrations was still infiltrating through the dike. A new project aiming at resolution of the described problem was started and is currently in the feasibility study phase.

ARTICLE 13. SITING OF PROPOSED FACILITIES

"1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed radioactive waste management facility:

(i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime as well as that of a disposal facility after closure;

(ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment, taking into account possible evolution of the site conditions of disposal facilities after closure;

(iii) to make information on the safety of such a facility available to members of the public;

(iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.

2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 11."

Review of the information, presented within the frame of the First National Report

The first national report presents the ASUNE requirements, concerning the authorization regime for new facilities site selection and the AEP requirements for EIA of such facilities. Information is presented about the legislative requirements for provision of information to the public and for consultation of the potentially affected neighboring countries. The first national report declares the Bulgaria intention to develop modern RW management secondary legislation, including requirements for the RW management facilities sites and to the site selection process.

RW management facility site selection

The site selection authorization regime for RW management facilities is the same as for any other nuclear facility, and has already been discussed in Article 7. The preliminary SAR and EIA are important part of the documentation for site approval by NRA. In the case of RW disposal facility the safety report shall include facility operational and post-closure safety assessment.

The new *Regulation for safety of RW management* establishes requirements on RW management facility sites, and especially on the disposal facility sites. These requirements include a list of the necessary site characteristics, ensuring the long-term stability of the facility and isolation of the RW from the public and the biosphere for periods, considerably longer that the facilities operational period.

The *Regulation for safety of RW management* establishes the site selection process, which is separated in four phases: development of disposal concept and site selection planning; data collection and regional studies; characterization of the sites and site confirmation. The Regulation establishes the requirements to the organization during the site selection process and the documents, prepared during every phase.

Access to safety information

The public access to safety information on proposed RW management facilities is guaranteed basically by the implementation of the legal provisions for an obligatory application of the EIA process to such facilities.

The implementation of the legal requirements can be seen within the presented below information about the planned activities on site selection for national LILW disposal facility.

Site selection for national RW disposal facility

In accordance with the approved by the Council of Ministers in 2004 *Strategy for SF and RW management,* new LILW disposal facility have to start operation until 2014. According to the Strategy, the disposal facility shall be modular, of near-surface type with a 50000 м^3 volume of the first stage. This volume will be sufficient for the accumulated RW and for the generated during the decommissioning of Kozloduy NPP units 1-4 waste.

Preliminary studies on disposal of LILW started during the 70-ties of the last century when several conceptual variants were considered. In the middle 80-ties field studies of the perspective sites were performed. Since the 90-ties until the Strategy approval in 2004 considerable amount of activities took place, including the phases "concept development and planning of site selection", "data collection and regional studies" and "characterization of the sites".

After the SC "RW" foundation in 2004 and the Strategy approval, the SE has performed activities on compilation of the results from the previously performed activities and on planning of future activities for site selection of LILW disposal facility. As a result, in August 2005 SC "RW" applied to NRA for site selection permit. The proposed for this purpose schedule includes finalization of the "approval of the selected site" phase including the EIA performance and consultations with the public and the stakeholders until the middle of 2006.

ARTICLE 14. DESIGN AND CONSTRUCTION OF FACILITIES

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

(i) the design and construction of a radioactive waste management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a radioactive waste management facility other than a disposal facility are taken into account;

(iii) at the design stage, technical provisions for the closure of a disposal facility are prepared;

(iv) the technologies incorporated in the design and construction of a radioactive waste management facility are supported by experience, testing or analysis."

Review of the information, presented within the frame of the First National Report

First national report presented the requirements of ASUNE concerning the nuclear facility design, valid for RW management facilities. Conclusion is made that the application of the design and construction requirements of the valid at that time Regulation № 7 and Regulation 0-35 does not provide for a satisfactory to the modern requirements safety level.

Finally, the intention of the Republic of Bulgaria to develop new safety requirement for RW management facilities in two-year period after the ASUNE approval was presented.

Changes in the legislation, concerning the RW management facilities design

Regulation for safety of RW management requires that the design of RW management facility shall ensure the radiation protection of the workers and the members of public during operation and, in the case of disposal facilities, during the post-closure period. The regulation contains detailed requirements to the facility design such as implementation of the defense-in-depth concept and clear definition of the design limits, operational states, classification of systems, structures and components and procedures for their qualification. The regulation contains precise requirements for the different types of waste management facilities, i.e.: processing, storage, and disposal. Generally, these requirements concern the design of new facilities, while the compliance of the existing facilities is established during the licensing process – during the initial licensing for operation and through the periodic safety reviews for extension of the license term of validity.

The different operational states are defined and analyzed and the different systems safety classes are established in the updated SAR of RWPP, presented together with the operation license application. The regulatory requirement for establishment of design limits is addressed in the SAR and is further developed in SU "RW – Kozloduy" documents defining requirements to the incoming for processing RW and to the produced waste packages. According to the SAR, the protection of the public from the potential harmful radiological impact of the facility is ensured through the systematic implementation of the defense-in-depth concept. Some of the NRA requirements to the updated SAR that shall be developed for the license extension in 2008 are related to more clear definition of the physical barriers, their effectiveness criteria and barrier protection measures.

The requirement for planning and application of measures facilitating facility decommissioning is included in Article 47 of the *Regulation for safety of RW management*. The Regulation contains also requirement for taking into account the decommissioning plan in the design of disposal facilities . The above clarifications are valid for the application of these requirements. The updated SAR of the RWPP contains description of the facility design characteristics facilitating its future decommissioning.

The *Regulation for safety of RW management* requires that design technical solutions, technologies and procedures of the planned facilities shall be defined and justified in accordance with the achievements of the science and the technology and with the internationally recognized operational experience.

ARTICLE 15. ASSESSMENT OF SAFETY OF FACILITIES

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

(i) before construction of a radioactive waste management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

(ii) in addition, before construction of a disposal facility, a systematic safety assessment and an environmental assessment for the period following closure shall be carried out and the results evaluated against the criteria established by the regulatory body;

(iii) before the operation of a radioactive waste management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

Review of the information, presented within the frame of the First National Report

The ASUNE requirements are presented, concerning the safety assessment and the AEP to perform EIA. A conclusion was made that the valid at that time Regulation № 7 doe not fully address all issues concerning safety assessment of RW facilities, in accordance with Article 15 of the Joint Convention.

Information on the plans for development of the respective legislation is presented and, on this basis, the conclusion that the Republic of Bulgaria had planned relevant measures for safety assessment of radioactive waste management facilities in compliance with Article 15 of the Joint Convention was made.

Changes in legislation, concerning the RW management facilities safety assessment

The requirements to the RW facility safety assessment are established in the new *Regulation for safety of RW management*, which also defines the safety criteria for this type of facilities. In accordance with the regulation he compliance with these criteria shall be subject of justification by safety assessments. Such requirements and criteria are established as well for RW repositories after their closure. The legally established RW facilities safety criteria are commented in Articles 24 and 11, iv.

The *Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy* establishes the requirements for the stages of development and updating of the safety assessment, which coincide with the Convention provisions.

ARTICLE 16. OPERATION OF FACILITIES

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

(i) the license to operate a radioactive waste management facility is based upon appropriate assessments as specified in Article 15 and is conditional on the completion of a commissioning program demonstrating that the facility, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions, derived from tests, operational experience and the assessments as specified in Article 15 are defined and revised as necessary;

(iii) operation, maintenance, monitoring, inspection and testing of a radioactive waste management facility are conducted in accordance with established procedures. For a disposal facility the results thus obtained shall be used to verify and to review the validity of assumptions made and to update the assessments as specified in Article 15 for the period after closure;

(iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a radioactive waste management facility;

(v) procedures for characterization and segregation of radioactive waste are applied;

(vi) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;

(vii) programs to collect and analyze relevant operating experience are established and that the results are acted upon, where appropriate;

(viii) decommissioning plans for a radioactive waste management facility other than a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body;

(ix) plans for the closure of a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility and are reviewed by the regulatory body."

Review of the information, presented within the frame of the First National Report

In the first national report are presented the ASUNE requirements, concerning the provisions of the Convention, Article 16. A conclusion is made that Bulgaria fulfils its obligations, concerning this Article.

Legislative changes, concerning the RW management facilities operation

The RW facilities operational safety requirements are established in ASUNE and the *Regulation for safety of RW management*. Some of them are common for all nuclear facilities, while others are specific for the respective facility. The requirements in some key areas of the RW facilities operation are presented below.

RW facilities operation authorization

The license regime and operational requirements of the RW facilities are the same as for other nuclear facility. The operational license issuance and the required conditions for this are already discussed in the report, in the part concerning Article 9.

Recently issued license on the name of SC "RW" for the operation of RW, generated at Kozloduy NPP, is based on a number of licensing documents, among them, the updated SAR from December 2003, report of the commissioning program completion and the EIA decision from 2001.

The SC "RW" request from August 2005 for PRRW "Novi han" operational license is submitted together with updated operational SAR from December 2004 and report on the latest version of the post-closure safety assessment.

Operational limits and conditions

The *Regulation for safety of RW management* establishes requirements for development of licensee internal rules including operational limits and conditions for RW facility. Usually the operational limits and conditions are compiled in one document that is approved by the regulatory body and a NRA permit is required for its modification. In the case of the RW management facility at Kozloduy site, the operational limits and conditions and the actions in case of their violation are contained in the Technical Specifications for Operation (TSO) document . The TSO have been updated 3 times, as a result of the accumulated experience during the commissioning program implementation.

Procedures, engineering support and maintenance

National legislation contains requirements for the development and application of internal procedures on facility operation, maintenance, monitoring etc., that shall be part of a QA system. The adequacy of these requirements is checked during the licensing process and as part of the NRA inspections at the facilities. The engineering support and technical maintenance are subject of special topical regulatory inspections.

The ASUNE requires the availability of engineering support and technical maintenance in all areas related to the safety and during the lifetime of the facility. License is issued to a juridical person, which possesses technical resources and sufficient number of qualified and authorized personnel for the whole operation lifetime of the facility.

Events reporting, analysis of operational experience

Article 19 of the ASUNE provides for inclusion in the operation license of conditions for reporting of incidents related to the safety. The reporting order and conditions are established in the *Regulation of the conditions and procedure for notification of the NRA about events in nuclear facilities and sites with sources of ionizing radiation* from 2004.

The licensees develop and apply procedures for analysis of the operational experience according to the requirements of Article 16 of ASUNE.

Five deviations from the normal operation, classified at level "0" by the INES scale, were reported during the Kozloduy RWPP test operation in implementation of the reporting and experience analysis procedures. In result 22 corrective measures were defined and implemented.

Characterization and sorting of the waste

The requirements in this area are provided by the *Regulation for safety of RW management*. The licensees shall apply their own procedures for characterization and sorting of the waste. During these activities the technological process features and the interfaces between the different stages of waste generation and waste management shall be considered (see Article 11, iii).

The RW characterization procedures in NPP Kozloduy are directed mainly towards identification of the waste characteristic for the purpose radiation protection during handling of the waste and towards identification of the waste further management path. The establishment of the RW characteristics, important for the long-term management, and especially the concentrations of long lived radionuclides, important for the disposal safety assessment, is still a pending issue. Undertaken activities for characterization of long lived radionuclide inventory of the waste in Kozloduy NPP are described in Section K of the report.

Post-closure safety assessment and decommissioning plan

Updating of all safety assessments (operational and post-closure), considering the results of the operation, monitoring, etc is required for extension of the operational license over its initial term of validity. . According to the national legislation the maximum operational license validity term for a nuclear facility is 10 years thus providing for an update of the safety assessments in a not longer than this period time intervals.

The *Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy* requires that a decommissioning plan shall be submitted to NRA for issuance of an operational license of any nuclear facility, and in the case of disposal facility a closure plan is required as well. The updates of the decommissioning plan shall be addressed in the updated safety assessment, required for the extension of the operational license.

Information concerning the stage of development of the decommissioning plans of the nuclear facilities in the country can be found in the report on Article 26.

By this moment, there is no closure plan for PRRW "Novi Han". The development of such plan will be done during the operational license documentation preparation .

ARTICLE 17. INSTITUTIONAL MEASURES AFTER CLOSURE

"Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility:

(i) records of the location, design and inventory of that facility required by the regulatory body are preserved;

(ii) active or passive institutional controls such as monitoring or access restrictions are carried out, if required; and

(iii) if, during any period of active institutional control, an unplanned release of radioactive materials into the environment is detected, intervention measures are implemented, if necessary."

Review of the information, presented within the frame of the First National Report

It was concluded, that the current regulatory base does not include requirements for institutional control after RW disposal facilities closure.

Bulgarian intention to add the respective requirements in the new regulations was presented.

Legislation changes, concerning the RW management facilities post-closure institutional control

The post-closure institutional control requirements are established in the *Regulation for safety of RW management*. The Regulation provides for two types of control – active and passive, and defines the minimum and the maximum duration of the control and requirements for establishment in the closure plan of organizational measures, necessary for control and preservation of the disposal information.

Intervention in the case of an unplanned release of radioactive materials after the closure of a disposal facility is provided for in the *Regulation for safety of RW management*. Intervention levels established in the *Regulation for emergency planning and emergency preparedness in case of nuclear and radiological accident* shall be observed.

SECTION I. TRANSBOUNDARY MOVEMENT

ARTICLE 27. TRANSBOUNDARY MOVEMENT

"1. Each Contracting Party involved in transboundary movement shall take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments.

In so doing:

(i) a Contracting Party which is a State of origin shall take the appropriate steps to ensure that transboundary movement is authorized and takes place only with the prior notification and consent of the State of destination;

(ii) transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilized;

(iii) a Contracting Party which is a State of destination shall consent to a transboundary movement only if it has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or the radioactive waste in a manner consistent with this Convention;

(iv) a Contracting Party which is a State of origin shall authorize a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph (iii) are met prior to transboundary movement;

(v) a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.

2. A Contracting Party shall not licence the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees South for storage or disposal

3. Nothing in this Convention prejudices or affects:

(i) the exercise, by ships and aircraft of all States, of maritime, river and air navigation rights and freedoms, as provided for in international law;

(ii) rights of a Contracting Party to which radioactive waste is exported for processing to return, or provide for the return of, the radioactive waste and other products after treatment to the State of origin;

(iii) the right of a Contracting Party to export its spent fuel for reprocessing;

(iv) rights of a Contracting Party to which spent fuel is exported for reprocessing to return, or provide for the return of, radioactive waste and other products resulting from reprocessing operations to the State of origin."

Review of the information, presented in the First National Report

First National Report pointed out that the export and the transport of nuclear materials, and SF in particular, are subject of the regulatory authorization. The authorization requirements are established in the ASUNE and the applicable regulations for its implementation.

It was noted that Republic of Bulgaria had only a practice as a state of origin of the SF. International treaties concerning the SF acceptance for processing by Russian Federation and SF transport through the territories of Moldova and Ukraine were presented.

Description of the transport scheme for railway and ship transport of SF was provided.

Legislation changes, concerning the transboundary movement of SF

The *Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy* from 2004 establishes a number of requirements, relating to the fulfillment of the obligations under this Article of the Convention.

The following documents must be attached to the nuclear material transport permit application:

- transport permits or the correspondent administrative acts, issued by the accepting and transit states authorities, in the case of export of nuclear material;
- documents regulating the relations between the sender and the recipient of the nuclear material, and between the applicant and any sub-contractors involved in the transport on the territory of the country;
- administrative acts issued by the respective competent authorities for transport packages approval according to the requirements of the *Regulation on the conditions and procedure for transportation of radioactive substances*;
- documents certifying that in the case that the transport cannot be performed or the transport conditions cannot be fulfilled the applicant will return the freight and the sender will accept it.

The SF transport safety requirements are established in *Regulation on the conditions and procedure for transportation of radioactive substances* from 2005. The regulation is developed in accordance with the IEAE Safety Requirements No. TS-R-1 "Regulations for safe transport of radioactive materials" as well as with the requirements of the respective international regulations for transport of dangerous goods:

- Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) (RID) of the Central Office for International Carriage by Rail (OCTI) – these rules are applications to the Convention concerning International Carriage by Rail (COTIF);
- European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR);
- Technical Instructions for the Safe Transport of dangerous goods by Air (ICAO Technical Instructions);
- International Maritime Dangerous Goods Code (IMDG Code by IMO).

SECTION J. DISUSED SEALED SOURCES

ARTICLE 28. DISUSED SEALED SOURCES

"1. Each Contracting Party shall, in the framework of its national law, take the appropriate steps to ensure that the possession, remanufacturing or disposal of disused sealed sources takes place in a safe manner.

2. A Contracting Party shall allow for re-entry into its territory of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess the disused sealed sources."

The execution of activities with radioactive sources is a subject of the authorization regime established with the ASUNE and the *Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy*. During these activities the *Regulation for the basic norms for radiation protection* and the specific requirements of the *Regulation for radiation protection during activities with sources of ionizing radiation* are applied.

NRA maintains a database of the issued licenses, which contains information about every source included in a license or a permit.

NRA exercises control over the use of SIR including the use of sealed radioactive sources. Normally inspection of a site where sealed sources are used or stored is performed once in two years or less.

When a source is no longer used it is considered a radioactive waste and according to the ASUNE it has to be transferred to organization that is licensed to manage RW. Spent sealed sources are in practice transferred for centralized storage to PRRW "Novi han", for and NRA is notified for each individual source transfer.

The cases of identified orphan sealed sources are addressed in the ASUNE. In such a case the source becomes state property and the NRA chairman assigns the person to deal with it and the conditions for that. Generally, such sources are sent for storage to PRRW "Novi Han".

The Republic of Bulgaria has undertaken measures for identification of orphan sources and for prevention of their transboundary movement and delivery to facilities where they can cause serious damage to the people and the environment. In the period 2003 – 2005 the national department "Border police" and NRA in coordination with the US government and EU performed projects to equip the border control passes with fixed and portable radiation detectors. Coordinated activities are undertaken to develop and apply standard procedures for the border control passes in the case of illegal traffic of nuclear materials and radioactive substances. By this moment all border passes are equipped with mobile detectors of sources of ionizing radiation and at two of the largest passes stationary equipment is installed. Stationary equipment is also installed at the scrap reception entrances of the two large metal processing facilities in the country.

Bulgarian legislation does not ban the re-import of sealed sources, produced in the country. Such is not performed in practice because Bulgaria is not a producer of sealed sources.

SECTION K. PLANNED ACTIVITIES TO IMPROVE SAFETY

Performance of the planned activities, according to the First National Report

The following table presents information about the implementation of the planned activities for safety improvement of the SF and RW management as declared in the first national report by the Joint Convention:

Change of the national infrastructure for RW management in 2004 and establishment and structuring of the SC "RW"	In accordance with the ASUNE a SC "RW" was created with specialized units SU "RW-Kozloduy" and PRRW – "Novi han". According to government decree № 992 from 14.12.2004 SC "RW" obtains ownership over a private state property for RW management on the site of Kozloduy NPP
Update the National Strategy for safe management of SF and RW until the end of 2003.	In accordance with the ASUNE the *Strategy for Spent Fuel and Radioactive Waste Management* was approved with a government decree from December 2004
Development of legislation, establishing the requirements, norms and rules for nuclear and radiation safety during the performance of the SF and RW management activities, including site selection, design, construction, commissioning, operation and decommissioning of SF and RW management facilities, until July 2004.	New regulations have been developed and were approved on time. See the report, Article 19 and Sections G and H.
Implementation of the long-term program for modernization of the SFSF	Most of the program is implemented – see the information in Section G, Article 5 of the report
Construction of interim "dry" SF storage facility on the NPP site	Design permit has been issued– see information in Section G, Art. 6 and 7 of the report
Site selection for national RW disposal facility until the end of 2008.	Permit application for site selection was submitted to NRA in August 2005. See the report, Art. 13.
Issuance of operating license for the RW processing, conditioning and storage facility at Kozloduy site until the end of 2003.	License issued, series E, No. 01740 on 29.04.2005
Implementation of the program for reconstruction and modernization of PRRW "Novi Han" until the end of 2007.	The program is under implementation. The implemented measures are described in the report, Art. 12.
Investigation of the Gabra site for extension of the PRRW "Novi Han" capacity until the end of 2004	According to the *Strategy for Spent Fuel and Radioactive Waste Management* permanent solution for the stored in PRRW "Novi Han" waste will be sought for in the frames of the planned on the national RW disposal facility. Gabra site activities are suspended.
Creation and maintenance of an information system and a data base of RW and RW management facilities	The database is under development by SC "RW". It is to be completed at the end of 2005.

Planned activities for safety improvement in the period 2005-2008.

The planned activities for safety improvement follow from the *Strategy for Spent Fuel and Radioactive Waste Management*, the conditions of the issued by NRA licenses and the plans and the programs of the regulatory body and the nuclear facilities operators.

The national basic strategic tasks are:

1. Site selection for national disposal facility for LILW by 2008.

2. Selection of disposal option for the high level waste by 2008.

The main planned legislative activities for safe management of SF and RW are the following:

1. Amendment of the legislation with the aim to guarantee the resources for long-term SF management and to establish the procedure and the conditions for delivery to the state of radioactive sources whose owner is unknown or bankrupted.

2. Development of regulatory guidance for application of the SF and RW management regulations.

The planned activities concerning the SF management safety improvement activities in Kozloduy NPP are:

1. Completion of the SFSF modernization program – see the information in Section G, Art. 5 of the report;

2. Construction of dry SFSF by 2009;

The planned activities, concerning the SF management safety improvement in INRNE – BAS are the preparation and the implementation of the SF transport from the research reactor to Russia during the period 2006 - 2007.

The planned activities, concerning the RW management safety improvement in Kozloduy NPP are the following:

1. Development of technology dissolution of the solid phase in the DC storage tanks;

2. Provision of conditions for transport of liquid RW from DC storage tanks of auxiliary building 1 to the tanks of auxiliary building 2;

3. Supply and installation of facility for treatment of low active liquid RW;

4. Supply and installation of measurement equipment for free release of material;

5. Construction of facility for treatment and conditioning of RW with high volume reduction factor;

6. Supply and installation of equipment for extraction and conditioning of spent ion-exchange resins;

7. Supply and installation of instrumentation and equipment for radiological inventarization.

The planned activities for safety improvement of RW management in SU “RW-Kozloduy” are the following:

1. Implementation of the measures from Schedule for Units, Details and New Facilities;

2. Characterization of the liquid RW of Kozloduy NPP, concerning the radionuclides, important for the long term safety of RW management;

3. Development and implementation of a program for removal from the “Lime facility” site of the stored raw RW;

4. Integration of the QA systems of SU “RW-Kozloduy” and of SC “RW” Head Quarters;

5. Update of the SU “RW-Kozloduy” emergency plan.

The planned safety improvement activities in PRRW “Novi Han” are:

1. Implementation of measures for minimization of the RW by development and implementation of a program for removal from the site of the accumulated RW with activity below the free release criteria;

2. Construction of a hot cell for acceptance control and sealed sources characterization;

3. Construction of RW processing facility and storage for conditioned RW on the PRRW "Novi Han" site;

4. Improvement of the radiation control and monitoring system, according to the new RW facilities on the site.

The planned activities on liquidation of the consequences from the uranium mining and milling industry include:

1. Construction of new water treatment installations, operating on the existing scheme for ion-exchange resins treatment at: "Peta Shahta – Shtolna 93", Kremikovci – Sofia; "Izgrev", village of Barutin, Dospat municipality; "Senokos", village of Senokos, Simitli municipality; "Selishte", village Selishte, Velingrad municipality.

2. Implementation of activities on conservation and restoration of "Buhovo" tailing pond;

3. Extension of the scope of liquidation activities in new facilities, related to the previous geological study activities.

SECTION L. ANNEXES

Annex L-1

List of the Facilities for Spent Fuel Management, Their Location, Basic Function and Main Characteristics

Annex L-2

Spent Fuel Inventory

Annex L-3

List of the Facilities for Management of RW, Their Location, Basic Function and Main Characteristics

Annex L-4

Radioactive Waste Inventory

Annex L-5

List of the International Treaties, Acts and Secondary Legislation Applicable to the Spent Fuel Management Facilities and Radioactive Waste Management Facilities.

Annex L-6

Human and Financial Resources

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Annex L-1

LIST OF SPENT FUEL MANAGEMENT FACILITIES, THEIR LOCATION, BASIC FUNCTION AND MAIN CHARACTERISTICS

I. NPP "Kozloduy

I.1 Spent fuel storage facility

The spent fuel storage facility (SFSF) is a separate building, located at the Kozloduy NPP site, where facilities and systems, providing subcriticality, residual heat removal and biological protection, are situated.

The spent fuel storage facility is designed for storage of spent fuel from reactors WWER-440 and WWER-1000 after at least three years of initial storage in at-reactor SF ponds. The storage is a "wet" type; the spent fuel is stored under water in pool with four compartments. The spent fuel storage fuel assemblies are stored in transport baskets.

The subcriticality is ensured by the basket construction (grid step and basket material) and spent fuel baskets' grid step in the pool. This allows the spent fuel pool to be filled in with demineralized water without reagents (boric acid, etc.), which significantly facilitates the operation of SFSF.

The residual heat removal is provided by:

- Heat exchangers, cooled with service water;
- Pool water evaporation;
- Ventilation of the main hall;
- Heat losses through the building structure;

Biological protection is provided by the building structure and the water layer above the spent fuel in the spent fuel storage pool.

SFSF is integrated with the following NPP systems:

- Physical protection system;
- Emergency planning;
- Radiation control;
- Fire protection;
- Accident signalization system;
- Treatment and storage of radioactive and non-radioactive waste;

The technical design of the existing SFSF was developed in compliance with the normative documents in force, during the 70^{s} of the last century, in the former Soviet Union. The spent fuel storage safety practically is based upon the application of the "in-depth protection" principle. The basic design solutions, applied in the process of SFSF construction are:

- The fuel assemblies are stored under water (chemically treated, at a temperature below 40°C), which protects them from damaging; suppresses the degradation processes of the cladding material of the fuel elements and the construction material of the fuel assemblies; the parameters

of the water chemical composition and its activity (the utmost radioactive contamination level is 1.11×10^5 Bq/l) are maintained by the water purification system;

- The cooling system (spent fuel residual heat removal) is designed with high redundancy level - the cooling water is supplied to the pools from above, their drainage, because of the siphon effect is impossible; there is a possibility for rapid water supply from the tanks with rate 10 times higher than the maximum designed controlled leakages from the pool;

- The pool's double lining provides high density and reliable control of leakages (the lining is supported from porous concrete layer, in case of leakage from the facing, the water is absorbed through the porous concrete layer to special collecting points from all directions of a given compartment and in the bottom center, it is collected by a system of controlled leakages and is directed towards the purification system);

- The massive building structure (reinforced concrete frame and reinforced concrete walls) of SFSF provides biological protection (the reinforced concrete walls and the pool bottom have a thickness of 1,5m);

- The spent fuel assemblies leak tightness during the transportation process and storage in normal and emergency conditions is ensured by the conditions for transport and storage; the untight spent fuel assemblies are stored in tight cans;

- The subcriticality is ensured by the transport baskets' structure (through geometrically safe configuration of the loading of the fuel) and storing conditions in the pool and does not depend on a permanent or burnable absorber. The assessment of subcriticality does not take into account fuel burn-up;

- The shipment of the fuel assemblies from the at-reactors SF ponds (minimum after 3 years storage of the WWER-440 fuel assemblies and minimum after 5 years storage of the WWER-1000 fuel assemblies) to SFSF is carried out by transport baskets in a fuel transportation cask; in the process of loading and transportation of the cask the personnel acts according to the especially developed instructions; the fuel assemblies are stored vertically;

- availability of ventilation systems, fire protection systems and control and management systems;

- availability of 12 control probe wells around the SFSF building for underground water activity control;

For safety substantiation of the SFSF the appropriate analyses were conducted. The constructional and neutron-physical features of the spent fuel assemblies provide their density and integrity conservation in case of completely dried pool, and air-cooling for a period of time, sufficient for the commencing of recovery activities (100 hours in case of the most unfavorable temperature conditions of the environment).

An additional safety assessment of the SFSF was conducted within the PHARE program during 1999. A standard list of accident scenarios is accepted as a basis for the safety analysis, based on IAEA document - Safety Series № 118 "Safety Assessment for Spent Fuel Storage Facilities".

After seismic analysis of the building structure, including the foundations of the equipment, important for the SFSF safety, and specifying the areas of admissible safety, was implemented an anti-seismic anchorage of the building construction, the equipment significant for the safety, 125t crane and the lighting bar. In the conducted review of the seismic stability of the transport baskets in the SFSF was not detected any necessity of supplementary anchoring of the transport baskets.

For the analysis of the possible period for continuous safe storage under water of the spent fuel assemblies have been conducted "accelerated corrosion testing" upon a specifically developed method, allowing modeling of the impact of the aggressive (water) environment for storage period of 30 years. The following tests confirmed the satisfactory status of the covers after 30 years of storage in water, if performing the established water chemistry regime:

- complex destructive and non-destructive tests of the fuel rods and other construction elements of a typical assembly with spent fuel from WWER-440 after continuous storage under water;
- tests with artificial hydrogen saturation and the defining of metal mechanical features of the cladding of the fuel rods;
- the accelerated corrosion tests and the results' analysis from other tests.

Assessment of the constructive materials status of the pool covers and the transportation baskets for storage has been conducted. Their integrity is also intact. Their corrosion stability is confirmed for a period of 30 years of SFSF operation.

I.2 At-reactor Spent Fuel Pond -1, 2, 3, 4

At-reactor SF ponds -1, 2, 3, 4 are designed for SF storage after the fuel is extracted from the reactor. They are placed adjacent to the corresponding WWER-440 reactor. They provide subcriticality spent fuel residual heat removal and biological protection.

The spent fuel is stored in racks. The capacity of at-reactor SF ponds -1, 2, 3, 4 is relevantly 704, 727, 728 and 726 assemblies.

The subcriticality is provided by the grid step in the rack, even when the pond is filled with demineralized water.

The spent fuel residual heat removal is ensured by the heat loss and compulsory cooling through heat exchangers with service water.

I.3 At-reactor Spent Fuel Pond -5 and 6

At-reactor SF ponds -5 and 6 are designed for SF storage after the fuel is extracted from the reactor. They are situated adjacent to the corresponding reactor WWER-1000. They provide subcriticality, spent fuel residual heat removal and biological protection.

Spent fuel is stored in racks. The total capacity of each pond is 612 assemblies.

Subcriticality is provided by the grid step in the racks and boron steel pipes, even when the pond is filled with demineralized water.

Spent fuel residual heat removal is provided by the heat loss and compulsory cooling through heat exchangers with service water.

The safety analyses of at-reactor SF ponds – 1 to 6 are part of the safety analysis report of the relevant unit.

II. Shaft repository in the nuclear research reactor IRT -2000.

The Nuclear Research Center at the Institute for Nuclear Research and Nuclear Energy /INRNE/ at the Bulgarian Academy of Science has a SFSF in water, constructed in the biological protection of the reactor's pool, called shaft repository. The access to it is from the reactor site.

The shaft repository has rectangular form with measures of the base 1910 mm x 1010 mm.

The shaft repository bottom is located at elevation +2.13, and the lid is thick 400 mm, manufactured from steel, at elevation +7.94. The biological protection is constructed from heavy concrete with thickness: 1755 mm of the west side; 1935 mm of the east side and 850 mm of the north side. South of the shaft repository is located the reactor pool, separated by heavy concrete with thickness 1900 mm. The walls are lined with aluminum sheets, and at the bottom there are distancing bars with pitch 190x170 mm also from aluminum, where clusters are formed for the fuel assemblies. The fuel assemblies are stored in vertical position at two levels. The clusters are 54, which allows the storage of 108 fuel assemblies.

The water in the shaft repository pool is distilled. The residual heat removal is absorbed by the walls of the shaft repository through natural circulation of the distillate. The water in the shaft repository is filtered via a circulation pump and a mechanical filter, located at the reactor site.

The water level in the shaft repository is automatically controlled. In case of its lowering to specified limits a sound and light emergency signalization system is actuated.

Fuel assemblies handling is carried out by special tools and equipment.

Annex L-2

SPENT FUEL INVENTORY

I. Kozloduy NPP

The spent fuel at Kozloduy NPP site, stored in the at-reactor SF ponds and in the SFSF, at 15.06.2005 contains 942.7 tones heavy metal /HM/. This amount is distributed into 5618 spent fuel assemblies from WWER – 440 and 723 spent fuel assemblies from WWER – 1000, total of 6341 spent fuel assemblies are stored.

Spent nuclear fuel inventory in SFSF at 15.06.2005

Reactor type	Assembly type	Initial enrichment at ^{235}U [%]	SFSF		**TOTAL**	
			Number of Assemblies	Heavy metal mass [kg]	**Number of Assemblies**	**Heavy metal mass [kg]**
WWER-440	116	1.6	2	708	**3 988**	**458 811**
WWER -440	124	2.4	95	11 087		
WWER -440	136	3.6	3363	388 376		
WWER -440	216	1.6	8	894		
WWER -440	224	2.4	419	46 990		
WWER -440	236	3.6	97	10 756		
WWER -1000	A	2.0	85	36 203	**168**	**71 217**
WWER -1000	B	3.0	33	13 940		
WWER -1000	Г	3.3	45	18 970		
WWER -1000	ГВ	3.3+3.0	5	2 104		
WWER -1000	ЕД	4.4+3.6	0	0		
WWER -1000	Е	4.4	0	0		
TOTAL					**4 156**	**530 028**

Spent nuclear fuel inventory in at-reactor SF ponds – 1,2,3,4 at 15.06.2005

Reactor type	Assembly type	Initial enrichment at ^{235}U [%]	SFP-1		SFP -2		SFP -3		SFP -4		**TOTAL**	
			Number of Assemblies	Heavy metal mass [kg]	Number of Assemblies	Heavy metal mass [kg]	Number of Assemblies	Heavy metal mass [kg]	Number of Assemblies	Heavy metal mass [kg]	**Number of Assemblies**	**Heavy metal mass [kg]**
WWER -440	116	1.6	1	118	0	0	2	237	0	0	**3**	**355**
WWER -440	124	2.4	17	1 993	19	2 217	7	810	23	2 678	**66**	**7 698**
WWER -440	136	3.6	430	49 876	418	48 448	289	33 369	230	26 599	**1 367**	**158 292**
WWER -440	216	1.6	2	226	0	0	0	0	0	0	**2**	**226**
WWER -440	224	2.4	57	6 393	45	5 043	14	1 568	8	902	**124**	**13 906**
WWER -440	236	3.6	0	0	12	1 324	32	3 549	24	2 670	**68**	**7 543**
TOTAL			**507**	**58 606**	**494**	**57 032**	**344**	**39 533**	**285**	**32 849**	**1 630**	**188 020**

Spent nuclear fuel inventory in at-reactor SF ponds – 5,6 at 15.06.2005

Reactor type	Assembly type	Initial enrichment at ^{235}U [%]	SFP -5		SFP -6		**TOTAL**	
			Number of Assemblies	Heavy metal mass [kg]	Number of Assemblies	Heavy metal mass [kg]	Number of Assemblies	Heavy metal mass [kg]
WWER -1000	A	2.0	0	0	0	0	**0**	**0**
WWER -1000	B	3.0	0	0	0	0	**0**	**0**
WWER -1000	Г	3.3	175	73 296	121	50 772	**296**	**124 068**
WWER -1000	ГВ	3.3+3.0	23	9 656	8	3 366	**31**	**13 022**
WWER -1000	ЕД	4.4+3.6	90	34 558	54	20 733	**144**	**55 291**
WWER -1000	Е	4.4	60	23 034	24	9 191	**84**	**23 225**
TOTAL			**348**	**140 544**	**207**	**84 062**	**555**	**224 606**

TOTAL FOR KOZLODUY NPP

Reactor type	Number of Assemblies	Heavy metal mass [kg]	Estimated activity [Bq]
WWER -440	**5 618**	**646 831**	**1.10^{18}**
WWER -1000	**723**	**295 823**	**6.10^{18}**
TOTAL	**6 341**	**942 654**	**16.10^{18}**

Description of spent fuel assemblies construction

1. Fuel assembly for WWER-440 reactor.

1.1 Fuel assembly (FA)

The fuel assembly is a non-dismountable construction and consists of a bundle of 126 fuel rods, fuel assemblies spacer grids, upper grids, support grid, central pipe, casing pipe, FA head and bottom nozzle.

The head and bottom nozzle have dimensions 144 mm. The total length of the FA is 3217 mm. The fuel assembly consists in approximately 120 kg heavy metal. The fuel assemblies are produced with enrichment of 1.6%, 2.4% and 3.6% and respectively are labeled with code 116, 124 and 136.

1.2 Regulating and shim fuel assembly (RSA)

The regulating and shim fuel assembly does not differ from a FA in general. The difference is as follows:

- the upper rod is 10 cm shorter, which results in 115 kg heavy metal contained;
- there is a bayonet clutch with a locking mechanism in the head;
- there is a mechanism in the bottom nozzle, which is pulled over the damper in the casing pipe at the bottom of the shaft in order to soften the shock.
- the wrench dimension of the top and bottom nozzles is 145 mm.

The regulating and shim fuel assemblies are produced with enrichment of 1.6 %, 2.4% and 3.6% and respectively are labeled with code 216, 224 and 236.

2. Fuel assembly for WWER-1000 reactor.

2.1 Assembly of TVS type

The TVS assembly is of non-dismountable construction and consists of a head with spring unit, central pipe, 18 casing pipes, 15 spacer grids, 312 fuel rods, and a bottom nozzle.

The assembly form is hexagonal with wrench dimension 234 mm. The total length of the TVS assembly is 4570 mm. The assembly contains approximately 430 kg heavy metal. The assemblies are produced with enrichment of 1.6% to 4.4% and are labeled with code: Н, А, В, Г, ГВ, Д, Е and ЕД respectively.

2.2 Assembly of TVSA type

The TVSA assembly is of non-dismountable construction and consists of a head with spring unit, central pipe, 18 casing pipes, 15 spacer grids, a bottom nozzle, as well as 312 fuel rods, including 6 fuel rods with burnable absorber Gd_2O_3.

The assembly form is hexagonal with wrench dimension up to 235 mm. The total length of the assembly is 4570 mm. The assembly consists of approximately 430 kg heavy metal. The fuel assemblies are produced with enrichment of 3.53% to 4.38 and are labeled with code Н, А, В, Г, ГВ, Д, Е and ЕД respectively.

II. Shaft repository in IRT-2000

General features of the stored SF

Fuel type	Number of Assemblies	Number of fuel rod	Estimated activity [Bq]	Residual heat release [W]	Mass $^{\Sigma}U$ [g]	Mass ^{235}U [g]	Assemblies' mass [kg]
EK-10	58	908	$1.126.10^{14}$	55.44	69328.70	5445.16	195.330
S-36	16	240	$0.136.10^{14}$	23.67	6041.95	2099.20	45.753
Total	**74**	**1148**	**$1.262.10^{14}$**	**79.11**	**75370.65**	**7544.36**	**241.083**

Description of Fuel assemblies for reactor type IRT- 2000

The reactor IRT-2000 nuclear fuel is classified according to type, the number of fuel rods, the fuel assembly geometry and delivery date.

There are two types of fuel:

- EK–10, with 10 % initial enrichment by ^{235}U, is UO_2 in matrix of Mg;
- C-36 with 36 % initial enrichment by ^{235}U metallic U in matrix of Al;

The assemblies are with square section, which could be with one chamfer (geometry type G), two chamfers (geometry type C), three chamfers (geometry type B), or without chamfers (geometry type A), and number of the fuel rods from 14 to 16.
The cladding of the fuel rod, the fuel assembly framework as well as all supporting elements, is made of aluminum.

The supply of fuel is provided three times:

- As part of the equipment in the process of its construction – 49 type EK-10;
- In 1980 – 9 type EK-10;
- In 1985 – 16 type C-36;

The spent fuel is stored in the shaft repository, placed in the biological shield wall of the reactor vessel.

Annex L-3

LIST OF THE FACILITIES FOR RADIOACTIVE WASTE MANAGEMENT, THEIR LOCATION, BASIC FUNCTION AND MAIN CHARACTERISTICS

1. KOZLODUY NPP FACILITIES FOR RW MANAGEMENT

1.1. Auxiliary Building - 1

The storage facilities are designed for temporary storage of solid waste class 2-I and 2-II, low and intermediate level liquid radioactive concentrates, and spent sorbents from the reactors operation.

The storage facilities are situated in a building with reinforced structure, separated part of auxiliary building – 1 (AB-1) serving units 1 and 2.

The storage facilities for solid RW are vault-type with upper hatch; they are seven, with different volume (from 80 m^3 to 230 m^3) and total net volume of 1010 m^3. The service conditions are room temperature and atmospheric pressure.

The storage facilities for liquid radioactive wastes are stainless steel tanks. Each of them is situated in a separate room provided with metal lining. The tanks are five and each of them has 10m diameter, 7 m height and net volume of 470 m^3. They are provided with a level control system. Operating conditions – temperature up to 100 ^oC, atmospheric pressure. A blow tank provides the radioactive liquid transport. Suction ventilation system of the tanks rooms provides for clean up of the exhaust gases.

The storage facilities for spent high-active sorbents are tanks from stainless steel. Each of them is situated in a separate room provided with metal lining. The tanks are two; each of them has 9.0 m diameter, 6.5 m height and net volume of 350 m^3. They are provided with a level control system. Operating conditions – temperature up to 100 ^oC, atmospheric pressure. The radioactive sorbents transportation is provided by hydro-discharge. The suction ventilation system of the tanks rooms provides for gas clean up.

The storage facilities for spent low-active sorbents are two, provided with a metal lining with dimensions 5,0 x 4,6 x 8,2 m and net volume of 188 m^3 each. Operating conditions – room temperature and atmospheric pressure. They are provided with a leakage control system. The suction ventilation system of the tanks rooms provides for gas clean up.

1.2. Auxiliary building - 2

The storage facilities are designed for temporary storage of solid RW 2-I and 2-II class, low and intermediate level liquid radioactive concentrates and spent sorbents from the reactors operation.

The storage facilities are situated in a building with reinforced structure, separated part of auxiliary building – 2 (AB-2), serving units 3 and 4.

Their characteristics are the same as of AB-1.

1.3. 1.3. Auxiliary building - 3

The storage facilities are designed for temporary storage of solid RW class 2-I and 2-II and 2-III, low and intermediate level liquid radioactive concentrates, the spent sorbents from the reactors operation.

The storage facilities are situated in a building with reinforced structure, separated part of auxiliary building – 3 (AB-3), serving units 5 and 6.

The storage facilities for solid class RW 2-I and 2-II are vault-type with upper hatch; they are eighteen, with different volumes (from 78 m^3 to 189 m^3) and total net volume of 2486 m^3. Operating conditions – room temperature, atmospheric pressure. Facilities are provided with fire alarm and fire-extinguish systems.

The storage facilities for solid RW class 2-III are vault-type with upper cylindrical hatch and monolithic reinforced structure providing the necessary bio-protection. Total net volume of 213 m^3. Operating conditions – room temperature, atmospheric pressure.

The storage facilities for liquid radioactive concentrates are tanks from stainless steel. Each of them is situated in separate room provided with metal lining. The tanks are seven, with total net volume of 3600 m^3. Three of them have 6.4 m diameter, 6.4 m height and net volume of 200 m^3, each and the rest four of them have 10 m diameter, 10 m height and net volume of 750 m^3, each. They are provided with a level control system. Operating conditions – temperature up to 100 ^oC, atmospheric pressure. The transport of radioactive liquids is provided by a vacuum-pressure-operated intermediate tank. The suction ventilation system of the tank rooms provides for exhaust gas clean up.

The storage facilities for spent sorbents are tanks from stainless steel. Each of them is situated in separate room, provided with metal lining. The tanks are two; each of them has 4,5 m diameter, 6,3 m height and net volume of 100 m^3. They are provided with systems for level and temperature control, hydro-transport of the radioactive liquids and fire extinguishing. Operating conditions – temperature up to 40 ^oC, atmospheric pressure. The suction ventilation system of the tank rooms provides for exhaust gas clean up.

1.4. Storage facility in reactor hall - 1

It is designed for temporary storage of solid RW class 2-III from the reactors operation; situated in main (reactor) hall (RH-1) of units 1 and 2.

The storage facility is tube-type. 400 concrete steel tubes with upper hatch, each having 0,18 m diameter, 8 m height and total net volume 81,6 m^3 are located in a monolithic reinforced concrete constructio providing the necessary biological protection. Operating conditions – room temperature, atmospheric pressure.

1.5. Storage facility in reactor hall - 2

It is designed for temporary storage of solid RW class 2-III from the reactors operation; located in reactor hall (RH-2) of units 3 and 4. The storage facility characteristics are the same as of RH-2.

1.6. Storage facility of sources of ionising radiation at "Metrology Service"

The sealed ionising radiation sources are stored in a designated storage room located in the premises of "Ionising radiation measurement" laboratory, Service Building – 1, Electro-production – 1.

The sources are stored according to permission by NRA, which is re-issued annually and is related with an NRA licence for use of ionising radiation sources.

1.7. Site for temporary storage of sources of ionising radiation in fire detectors

Sources of ionising radiation used in fire detectors are storage in the following locations: Laboratory "Radiometry", ОПИС V unit, Room 6 DE, room 3005 at elevation 30.00 – turbine hall – east staircase cage VI unit and "Kulata" storehouse.

The sources are stored according to permission by NRA with 5 years term of validity, which is related with an NRA licence for use of ionising radiation sources.

2. FACILITIES FOR RW MANAGEMENT, OWNED BY SE "RW", LOCATED ON THE SITE OF KOZLODUY NPP – SU "RW – KOZLODUY"

2.1. RW processing plant (RWPP)

It is a separate installation designed for pre-treatment, treatment and conditioning of RW generated from Kozloduy NPP.

The conditioning process includes:

- extraction of the liquid RW from the tanks for liquid radioactive concentrate;
- transport to the RWPP;
- concentrating of the liquid radioactive concentrate (when necessary) by evaporation;
- pH correction;
- dosing of the liquid radioactive concentrate, the cement and the supplements;

- mixing, homogenisation and filling of the cement radioactive mixture into reinforced concrete container;
- sealing the package (placing and closing the cover, sealing up the cover's hole)

The regulatory body has licensed the reinforced concrete container for transport and storage of the conditioned RW.

Thereby the conditioned RW are stored on the site of Kozloduy NPP and are subject of further disposal without additional treatment.

There are two separated processing lines in RWPP:

2.1.1. Line "Solid RW"

It is designed for sorting and treatment by compaction of solid RW in order to reduce the volume and to prepare them for further conditioning. The line includes:

- Centre for receiving and uploading of solid RW;
- Sorting table;
- Two presses with 50 t force;
- Mechanism for sealing of 210 litres tanks;
- System for measuring of wastes' activity;
- Super-compactor with 910 t force;
- Two depots for tanks;
- Roll conveyors;
- Crane-manipulator;
- 20 tonnes transport carriage;
- Two cranes with load capacity of 40 t.

2.1.2. Line "Liquid RW"

It is designed for treatment and conditioning of liquid RW including RW packaging. The line includes:

- Specialised tank truck for transport of the liquid RW from the temporary storage facilities;
- Centre for receiving and uploading of liquid RW;
- Two receiving tanks for liquid RW with 40 m^3;
- Two-stages evaporator with receiving tanks for distillate and condensate;
- Two tanks for concentrated liquid RW with 12 m^3;
- Receiving bins for cement and chemical supplements;
- Batcher for the cement and the supplements;
- Mixer;
- Pumps, tanks, etc.

RWPP is provided with all necessary safety systems and external communications.

Construction of an installation for decontamination of metal RW is forthcoming.

2.2. Storage facility for conditioned RW

It is designed for temporary storage (prior to disposal) of conditioned RW from Kozloduy NPP.

It is a surface ferroconcrete facility which provides the necessary engineering barriers between the stored RW and the personnel and the environment. Its capacity is 1920 reinforced concrete containers with conditioned RW (960 in each field "A" and "B", in 4 rows one on top of the other). Two bridge cranes of 25 t load capacity each (one for each field) perform all transport operations in the storage facility. They are provided with grip devices for arranging and positioning of the containers with RW.

2.3. Site "Lime Plant"

A site where the following sub-sites for RW management are separated:

2.3.1. Storage facility of trench type for storage of solid RW

It is designed for temporary storage of solid RW of class 2-I and 2-II and serves all nuclear facilities at the Kozloduy NPP site.

The storage facility is surface ferroconcrete construction facility of vault-type. It is separated on forty cells with upper hatch, each with dimensions 2.7 x 5.9 x 6.0 m and volume 96.5 m^3. Operating conditions – ambient temperature, atmospheric pressure.

2.3.2. Storage facility for temporary storage of processed solid RW.

It is designed for temporary storage of processed solid RW of class 2-I and 2-II from all nuclear facilities at the Kozloduy NPP site.

The storage facility is of building type, reinforced concrete panel structure with transport aisle. The processed solid RW are stored in metal pallets, arranged in three rows in height.

Installation for incineration of solid RW class 2-I and 2-II and liquid RW is installed in a separate room in the building. It is at setting up stage.

2.3.3. Sites (№1 и №2) for temporary storage of solid RW in reinforced concrete containers.

It is designed for temporary storage of processed solid RW of class 2-I and 2-II, packed in reinforced concrete containers. It serves all nuclear facilities at the Kozloduy NPP site. The site is with capacity for placing of 2000 reinforced concrete containers.

The reinforced concrete container is licensed for transport and storage of solid RW 2-I and 2-II class. It is with overall dimensions 1,95x1,95x1,95 m and net volume of 5 m^3. Its walls ensure bio-protection in a way, that the power of the equivalent dose does not exceed 2 mSv/h in any point its external surface, and 0.1 mSv/h at 1 m distance from the surface. Operating conditions – ambient temperature, atmospheric pressure.

The package is in conformity with Technical Specification RW TR-02/11.07.01.

2.3.4. Site for temporary storage of solid RW in heavy weight containers.

It is designed for temporary storage of low-active solid RW class 2-I and 2-II class. It serves all nuclear facilities at the Kozloduy NPP site. The site is with capacity for placing of 14 heavy weight containers.

The heavy weight container with side door is with overall dimensions 5,8x2,2x2,4 m and net volume of 30 m^3. Operating conditions – ambient temperature, atmospheric pressure.

3. FACILITIES FOR RW MANAGEMENT OF INRNE – RESEARCH REACTOR IRT-2000

3.1. Tanks for storage of low-active RW

Two tanks with volume of 150 m^3 each, located at 6 m depth, reinforced concrete structure with stainless steel lining.

4. STORAGE FACILITIES FOR RW MANAGEMENT OF INRNE – PSRAW NOVI HAN.

4.1. Storage facility for non conditioned solid low and intermediate level short-lived RW (2a class)

The storage facility is with capacity of 237 m^3. It consists of three identical cages, with dimensions 5 x 4.5 x 3.5 m. It is dug into ground reinforced concrete multi barrier facility with 15.7 m length, 5.83 m width, and height of the aboveground part 1.2/1.6 m. It is constructed of reinforced concrete with 300 mm thickness, two-sided hydro-insulated with 20 mm bituminous insulation, with lining of 4 mm stainless steel sheets. The internal walls are additionally strengthened with supporting brick walls with 120 mm thickness. The storage facility is filled up from the surface through 7 hatches with external diameter 100 cm and 120 sm. According to the design, after the fulfilling of the cages, they will be grouted with concrete.

4.2. Storage facility for conditioned put in plaster matrix biological RW, low and intermediate level short lived wastes (2a class)

The capacity of the storage facility is 80 mm^3. Its construction is analogical to the above described one with smaller dimensions – 8.35 m length, 4.00 m width, 2.5 m depth, and 0.5 m height of the overground part (roof construction). The facility is fulfilled from the surface through 8 hatches with dimensions 80 x 80 cm.

4.3. Storage facility for unconditioned low and intermediate level sealed sources (2a class)

Its capacity is 1 m^3. The reinforced concrete facility, with lining of stainless steel is situated in 5.5 m depth under the ground surface. The sources are received through serpentine of stainless steel with 5 mm diameter. The heavy concrete and 5 lead plates with 10 mm thickness, situated between the storage facility and the surface provide the protection against ionising radiation. The storage facility is additionally protected with heavy roof construction.

4.4. Engineering trench for solid RW for unconditioned solid low and intermediate level short lived solid wastes (2a class)

The storage facility is with capacity of 200 m^3 and dimensions 29 m length and 4.1 m width. It consists of 8 cages built up of ready made reinforced concrete elements with 300 mm thickness, bituminous hydro-insulation and supporting brick wall. It is provided with a drain system. It is fulfilled from the ground surface through hatches with diameter 130 cm. Three of the cages are completely fulfilled, stabilised with cement grout, and covered with temporary protective coating.

4.5. Tanks for temporary storage of low-active short lived liquid RW

Four tanks of stainless steel type 1X18H9T with 4 mm thickness, constructed in reinforced concrete cages with dimensions 5.7 x 7.4 x 4.3 m on concrete supports at 0.5 m above the cage's floor. The cage is completely dug into the ground. The capacity is 48 m^3.

4.6. Site for temporary storage of low-active short and long lived wastes (2a and 2b class) in railway containers.

Fire alarm detectors in transport packages, solid RW and β,γ-misused sources with low specific activity, which do not require additional protection, neutron sources and α-sources in transport packages are stored on the site.

The railway containers are with dimensions 6.00 x 2.35 x 2.4 m. The site capacity is 14 railway containers with 462 m^3 total volume.

4.7. Site for temporary storage of medium-active short- and long lived RW (2a and 2b class) in concrete receivers "PEK" type, reinforced containers "StBKKUB" and reinforced concrete containers "StBKGOU"

On the site are stored misused sources in transport packages in concrete receivers "PEK" type, sealed sources in reinforced concrete containers StBKKUB and not completely discharged gamma-irradiation facilities in reinforced concrete containers StBKGOU. The site capacity is 171 StBKKUB with 248 m^3 total volume, 6 "PEK" with 74 m^3 total volume and 18 StBKGOU.

4.8. Site for storage of low-active RW

RW are stored in 200-liters tanks and in euro-pallets. The site capacity is 400 tanks and 100 euro-pallets. The occupied volume is 331.1 m^3.

4.9. Facility for RW treatment

It is designed for RW entry check and identification, sorting out, partial re-packing, RW preparing for storage, decontamination of equipment and vehicles, treatment of low-active water from the operation of the site.

5. FACILITIES FOR RW MANAGEMENT FROM THE CLOSED DOWN URANIUM MINING

5.1. Tailings pond Buchovo – 1

It is located 1 km east of the town of Buchovo. From 1956 to 1960 has served the activity of the hydrometallurgical plant "Metalurg" – Buchovo. The tailings pond covers 24 hectares. Its volume is 1.3 millions m^3 and is fulfilled, comparatively well compackted and partially re-cultivated.

5.2. Tailings pond Buchovo – 2

It is located 1 km east of the town of Buchovo. Until 1992 has served the activity of the hydrometallurgical plant "Metalurg" – Buchovo. The tailings pond covers 14.5 hectares. Its volume is 10 millions m^3. The tailings are about 4.5 millions tons.

The facilities, which have served the tailings pond activity, are not in operation.

The RW from the decommissioning of "Metalurg" plant are stored in trenches, made in the tailings pond's strip of beach.

5.3. Tailings pond "Eleshnitsa"

Tailings pond is located at 3 km south of village of Eleshnitsa. Until 1997 has served the activity of the hydrometallurgical plant "Zvezda", village of Eleshnitsa. It covers area of 231 decares. The stored tailings are over 9.0 millions tons, including solid waste of 7 680 tons. The total activity is tentatively estimated to 1.5×10^{15} Bq. At the present time, the activities on preservation and re-cultivation of the tailings pond are about finishing. A decontamination centre is constructed for decontamination of the drain water.

5.4. Facility for sorption treatment of contaminated with uranium mine water at the "Chora" sector

It is located near the town of "Buchovo", 18 km north-east of Sofia.

The facility treats contaminated with uranium mine water, produced by:

- water effusion from the outsets of adits №№ 95;120;127;
- water effusion from drillings in the area of adit 0127.

The main parameters of the entry water are:

- capacity from 800 м ^{3} to 2100 м ^{3} for twenty four hour period;
- content of the uranium in the water – up to 1.9 mg/l
- pH 7,3 – 8,4.

The facility consists of the following equipment:

- two pump stations for mine water – under the barrage at adit № 127 and pump station under adit № 95;
- head reservoir with dimensions 10 x 39 x 2.5 m;
- two sorption towers with net working volume of 25 m^3 each;
- sorbent catcher;
- buffer for water, purified from uranium with volume 35 m^3;
- centrifugal pump;
- hydraulic elevator;
- buffer for poor resin with volume 15 m^3;
- buffer for reach resin with volume 16 m^3.

5.4. Facility for sorption treatment of contaminated with uranium mine water at the "Bialata voda" sector

It is located 30 km west of town of Dolna Bania. The facility treats contaminated with uranium mine water, produced by the following effusion points:

- water from the barrage in the gully under the formerly waste heaps;
- water from the outset of adit №1;
- water from the drilling
- the average capacity of the gravitational receiving water for treatment is 500 m^3 / 24 hours period.

The facility consists of the following equipment:

- barrage under waste heaps;
- receiving basin (sedimentation tank) at adit №1;
- sorption tower;
- sorbent catcher;
- buffer for poor resin with volume 15 m^3;
- buffer for reach resin with volume 18 m^3.

- sedimentation tank after sorption;
- buffer for re-circulation solutions with volume 30 m^3;
- two centrifugal pumps
- nearby to the facility is established express-laboratory for determination of the uranium content in solutions and resins.

5.4. Facility for sorption treatment of contaminated with uranium mine water at the "Iskra" sector

It is located 10 km north-west of town of Novi Iskar. The receiving water to be treated is self-effusion water from the outset of adit № 5, which at the present is with capacity of about 20 m^3 per 24 hour period, pH – 3,0 and content of uranium 1.0 mg/l.

On the site are situated the following equipment, which are remained from the uranium mining. They have served the activities on water treatment up to year 2000:

- receiving buffer for reach solutions – 35 m^3;
- five centrifugal acid-resisting pumps;
- two sorption towers with net working volume 25 m^3;
- sorbent catcher with net 0.4 mm;
- a sorption tower with capacity 8.0 m^3;
- sorbent catcher
- receiving buffer for poor solutions – 35 m^3;
- reinforced concrete reservoir for water neutralisation with lime;
- receiving cone for poor resin;
- centrifugal pump
- hydraulic elevator;
- buffer for poor resin 15 m^3;
- buffer for reach resin 15 m^3.

In the future, the listed above equipment will be dismantled.

At the present, due to the decrease of the receiving for treatment water, the facility is reconstructed. With this regard, on the site are placed additionally:

- sorption tower with capacity 2.0 m^3, which will serve independently the processes on water treatment. It is made of propylene – tube with 1000 mm diameter and 15 mm wall thickness;
- vessel for lime treatment of water;

- in the decontamination system is included the existing receiving reservoir.

The three facilities treat the mine water from uranium, by following technology procedure with use of ion-exchange resins. The used sorbent is anion type AMP or Varion AP.

The structure of the facilities allows the mine water treatment in different climatic conditions and provides acceptable process parameters, included in the frame of the legal requirements for environment preservation according the index "Uranium content". The facilities operational mode is continuous.

The electrical power supply for all sites is provided from the national electrical grid with the exception of "Iskra" site, where a diesel-generator is used.

5.7. Line for regeneration cleaning of ion-exchange resins.

An integral part of the technology of the mine water sorption treatment from uranium is the line for regeneration cleaning of ion-exchange resins (LROYS). It is situated on the site of the former uranium processing plant "Zvezda", located 3 km south of village of Eleshnica, Blagoevgrad district.

The facility for regeneration of the anion sorbents type AMP or Varion AP includes:

- washing out from mechanical impurities of the receiving enriched with uranium resin. It is performed with drum-net with wholes of the net 0.63 mm and water consumption 1÷2 m^3/ m^3 sorbent.
- water extraction of the washed out from mechanical impurities resin by spiral classificator;
- entry of the dehydrated (to 20÷30 % moisture) reach resin in a dose vessel, fulfilled with 110-110 g/l H_2SO_4 solution;
- veritable sorbent regeneration, which is performed in counter-flow tower with 110g/l H_2SO_4 solution at up to 10 m^3 sorbent consumption and contact time by sorbent above 30 hours. The regeneration tower should operate with covered by sorbent upper drainage, the reached resin should be fed from above, the regenerating solution – from the bottom upwards, the regenerant pass through the upper drainage and the regenerated (poor) resin is drawn with aero-lift from the lower layers in the towel;
- water extraction from the poor resin, putting back in the transport solution to the buffer for regenerating solution;
- washing out of the regenerated (poor) resin from acid in the counter-flow tower with natural water 1÷2m^3/ m^3 sorbent;
- water extraction of the washed up resin;

- inversion of the regenerated sorbent from H^+ state in OH^- state, by treatment in the counter-flow tower with 0,5÷1m^3/ m sorbent with 60g/l $NaCO_3$ solution until alikaline reaction is achieved (pH≥7 at the tower's exit)
- water extraction of the inversed resin;
- washing out of the inversed sorbent from Na_2SO_4 with natural water 2m^3 / m^3 sorbent;
- neutralisation of the acid water with whitewash $Ca(OH)_2$ in pneumatic agitators to pH within 6÷8,5;
- storage of the regenerated and inversed resin before forwarding to the facilities for sorption mine water treatment from uranium;
- uranium extraction from the regenerated substance in four-cameras counter-flow extractor;
- re-extraction of the uranium from the organics with NH_4HCO_3 solution;
- separation in three-stages cone buffer;
- water extraction by vacuum-filter of the prepared crystal amonium uranil-three-carbonate (AUTC) $NH_4UO_2(CO_3)_3$;
- packing and storage of AUTC.

  At full power operation, the parameters of the process of LROYS are:
- regeneration time – 30 h;
- maximal resin output – 0,5 m^3 / h;
- consumption of regenerating solution – 10 m^3 / m^3 resin;
- potential of oxygenation - deoxidi-zation – 500–500mV;
- water consumption – 1–1,5 m^3 / m^3 resin.
- At the present the LROYS operates at 25% of its capacity.

  At the present the LROYS operates at 25% of its capacity.

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Annex L-4

RADIOACTIVE WASTES INVENTORY

1. Kozloduy NPP Plc.

(towards 15.06.2005 г.)

1.1. AB-1

1.1.1. Solid RAW – class 2-I and 2-II

RAW volume towards 01.01.05 - 534 m^3

Physical components (vol. **%)** – textile (0%), metal (22%), filings (0%), wood (2%), construction debris (0%), polymers (20%), wadding (0%), rubber (0%), paper (0%), mixed (56%).

Processing

	Processed Wastes (vol. %)	Volume Reduction Factor
Pre-compaction		-
Super-compaction		-
Packing		-
Not treated	100	-

1.1.2. Liquid RAW

1.1.2.1 Liquid radioactive concentrate - class 2-C

RAW volume towards 01.01.05 - 2050 m^3

General description - Liquid radioactive concentrates with total salts content 35-48 %, boron acid concentration up to 7 %, pH 8 –9 for the particular tanks. Presence of precipitated solid phase.

Radionuclides inventory: $^{134}Cs - 6.10^6$ Bq/dm^3, $^{137}Cs - 4.10^7$Bq/dm^3

^{60}Co - 2.10^6 Bq/dm^3, $^{54}Mn - 8.10^4$ Bq/dm^3

1.1.2.2. Spent sorbents - class **2-C**

RAW volume towards 01.01.05 - 347m^3 (HST - 131m^3; LST - 216m^3)

General description – Spent organic and non-organic sorbents. The radioactive levels vary considerably depending of the sorbents proportion in the particular sources. The sorbents are accumulated under water in tanks. They are homogeneously dispersed in the volume and can be easily transported.

The physical and the chemical characteristics are analogous to these of the initial sorbents used in this activity. There is a presence of small amounts of active carbon. Proportion – about 70% vol. sorbent and about 30% vol. water.

Radionuclides inventory: ^{134} Cs – 6.10^6 Bq/dm^3, ^{137} Cs – 4.10^7 Bq/dm^3

^{60} Co – 2.10^6 Bq/dm^3 , ^{54}Mn– 8.10^4Bq/dm^3

1.2. AB-2

1.2.1. Solid RAW - class **2-**I and 2-II

RAW volume towards 01.01.05 – 219,7 m^3

Physical components (vol. %) – textile (4%), metal (1%), filings (1%), wood (4%), construction debris (0%), polymers (42%), wadding (1%), rubber (0%), paper (0%), mixed (47%).

Processing

Processing done - 1313 number of drums (200 l)

	Processed Wastes (vol. %)	Volume Reduction Factor
Pre-compaction		-
Super-compaction	54,5	7
Packing		-
Not treated	45,5	-

1.2.2. Liquid RAW

1.2.2.1. Liquid radioactive concentrate - class 2-C

RAW volume towards 01.01.05 - 1900 m^3

General description - Liquid radioactive concentrates with total salts content 28-35 %, boron acid concentration up to 7 %, pH 8 –9 for the particular tanks. Presence of precipitated solid phase.

Radionuclides inventory: ^{134}Cs – 5.10^6 Bq/dm^3, ^{137}Cs – 3.10^7Bq/dm^3

^{60}Co - 1.10^6 Bq/dm^3, ^{54}Mn – 5.10^4 Bq/dm^3

1.2.2.2. Spent sorbents - class **2-C**

RAW volumes towards 01.01.05 - 225 m^3 (БВС – 95 m^3; БНС – 130 m^3)

General description – Spent organic and non-organic sorbents. The radioactive levels vary vastly, depending of the sorbents proportion in the particular sources. The sorbents are accumulated under water in tanks. They are homogeneously dispersed in the volume and easily can be transported.

The physical chemistry characteristics are analogous to these of the initial sorbents, which are used in this activity. There is presence of small amounts of active carbon. Proportion – about 70% vol. sorbent and about 30% vol. water.

Radionuclides inventory: ^{134} Cs – 5.10^6 Bq/dm^3, ^{137} Cs – 3.10^6 Bq/dm^3

^{60} Co – 1.10^6 Bq/dm^3 , ^{54}Mn– 5.10^4Bq/dm^3

1.3. AB-3

1.3.1 Solid RAW – class **2-**I and 2-II

RAW volume towards 01.01.05 – 1086 m^3

Physical components (vol. %): metal (22%), wood (2%), polymers (20%), mixed (56%)

Processing

Processing done - 5182 number of drums (200 l)

	Processed Wastes (vol. %)	Volume Reduction Factor
Pre-compaction	100	3
Super-compaction		
Packing		
Not treated		

Radionuclides inventory [Bq/kg]:

^{54}Mn – 3.10^4	^{110m}Ag – 2.10^4
^{59}Fe – 2.10^4	^{134}Cs – 2.10^4
^{58}Co – 2.10^4	^{137}Cs – 6.10^4
^{60}Co – 2.10^5	^{95}Nb – 5.10^3

1.3.2. Solid RAW - class **– 2-**III

RAW volumes towards 01.01.05 - 10 m^3

Physical components – Generally metal RAW

1.3.3. Liquid RAW

1.3.3.1. Liquid radioactive concentrate - class 2-C

RAW volume towards 01.01.05 - 2767 m^3

General description – 1778 m^3 liquid radioactive concentrates with total salts content 80 ÷ 355 g/l, boron acid concentration from – 17 ÷ 63 g/l, pH 8 ÷12. Presence of precipitated 989 m^3 solid phase.

Radionuclides inventory: ^{134}Cs – $1{,}5.10^5 \div 2{,}5.10^6$ Bq/dm^3, ^{137}Cs – $1{,}9.10^5 \div 1{,}1.10^7$ Bq/dm^3, ^{60}Co – $1{,}1.10^4 \div 4{,}0.10^4$ Bq/dm^3

1.3.3.2. Spent sorbents - class **2-C**

RAW volume towards 01.01.05 - 118 m^3

General description – Spent organic sorbents. The radioactive levels vary considerably, depending of the sorbents sources. The sorbents are accumulated under water in tanks. Their physical chemistry characteristics are analogous to these of the initial sorbents, which are used in this activity. There is presence of small amounts of active carbon. Proportion – about 70% vol. sorbent and about 30% vol. water.

Radionuclides inventory: ^{134}Cs – $1{,}5.10^4 \div 1{,}4.10^7$ Bq/dm^3, ^{137}Cs – $5{,}9.10^4 \div 3{,}7.10^7$ Bq/dm^3

^{60}Co – $1{,}5.10^6 \div 2{,}2.10^6$ Bq/dm^3 , ^{54}Mn– $2{,}2.10^5 \div 5{,}5.10^5$ Bq/dm^3

1.4. Storage facility in Main Reactor Hall – 1 (RH-1)

1.4.1. Solid RAW - class – 2-III

RAW volume towards 01.01.05 – 52,3 m^3

1.5. Storage facility in Main Reactor Hall – 2 (RH-2)

1.5.1. Solid RAW - class – 2-III

RAW volume towards 01.01.05 – 31,8 m^3

1.6. Storage for Radioactive Sources (SRS)

Out of use radioactive beta –sources of "Blenker" type.

Number: Above 300

Physical components (vol. %) – steel (60%), copper (20%), bakelite (20%)

Radionuclides inventory: **Total Activity**: ≈ 2.10^6 Bq

Generally ^{90}Sr /^{90}Y

1.7. Fire Detectors (FD) with radioactive sources

Outs of use FD with radioactive alpha-sources.

Number: 2500

Physical components (vol. %) – stainless steel (100% - after the sources discharge)

Radionuclides inventory: ^{241}Am **Total Activity: 7**.10^7Bq

2. SE "RAW", Branch Kozloduy

2.1. Trench Storage for Temporary Store of Solid RAW – "TS"

2.1.1. Solid RAW - class **2-**I and 2-II

RAW volume towards 01.01.05 – 3577 m^3

Physical components (vol. %) – textile (3%), metal (2%), filings (0%), wood (1%), construction debris (1%), polymers (0%), wadding (1%), rubber (0%), paper (0%), mixed (92%).

Processing

Processing done - 5297 number of drums (200 l)

	Processed Wastes (vol. %)	Volume Reduction Factor
Pre-compaction		
Super-compaction	86	7
Packing		
Not treated	14	-

Radionuclides inventory, Bq/kg :

$^{54}Mn – 2.10^4$	$^{110m}Ag – 3.10^4$
$^{59}Fe – 2.10^3$	$^{134}Cs – 1.10^4$
$^{58}Co – 9.10^3$	$^{137}Cs – 7.10^4$
$^{60}Co – 2.10^5$	$^{95}Nb – 4.10^3$

2.2. Storage Facility for Temporary Storage of Treated Solid RAW – "BC"

2.2.1. Solid RAW - class **2-**I and 2-II

RAW volume towards 01.01.05 - 467 m^3

Physical components (vol. %) – textile (23,23%), metal (5,48%), filings (1,2%), wood (1,98%), construction debris (8,23%), polymers (1,32%), wadding (9,37%), rubber (0,5%), paper (0,07%), mixed (48,62%).

Processing

Processing done – 5541 number of drums (200 l)

	Processed Wastes (vol. %)	Volume Reduction Factor
Pre-compaction		
Super-compaction	100	7
Packing		
Not treated	-	-

2.3. Site № 1 for Temporary Store of Solid RAW reinforced concrete containers – "BC"

2.3.1. Solid RAW - class **2-**I and 2-II

RAW volume towards 01.01.05 - 259,8 m^3

Physical components (vol. %) – textile (26%), metal (6%), filings (2%), wood (2%), construction debris (12%), polymers (2%), wadding (12%), rubber (1%), paper (0%), mixed (36,44%).

Processing

Processing done – 2979 number of drums (200 l), 99 armoured concrete containers

	Processed Wastes (vol. %)	Volume Reduction Factor
Pre-compaction		
Super-compaction	100	7
Packing	StBK	
Not treated	-	-

Radionuclides inventory, Bq/kg:

$^{54}Mn – 3.10^4$	$^{110m}Ag – 3.10^4$
$^{59}Fe – 4.10^3$	$^{134}Cs – 6.10^4$
$^{58}Co – 1.10^4$	$^{137}Cs – 6.10^4$
$^{60}Co – 2.10^5$	$^{95}Nb – 5.10^3$

2.4. Site № 2 for Temporary Storage of Solid RAW reinforced concrete containers – "BC"

2.4.1. Solid RAW - class **2-**I and 2-II

RAW volume towards 01.01.05 – 74.1 m^3

Physical components (vol. %) - 200-liters tanks with Solid RAW, super-pressed and immobilised in concrete non-radioactive matrix.

Processing

Processing done – 186 number of drums (200 l), 10 **reinforced concrete** containers

	Processed Wastes (vol. %)	Volume Reduction Factor
Pre-compaction		
Super-compaction	100	7
Packing	StBK	
Not treated	-	-

Radionuclides inventory [Bq/kg]:

$^{54}Mn – 3.10^4$	$^{110m}Ag – 5.10^4$
$^{59}Fe – 3.10^3$	$^{134}Cs – 7.10^4$
$^{58}Co – 2.10^4$	$^{137}Cs – 1.10^5$
$^{60}Co – 3.10^5$	$^{95}Nb – 6.10^3$

2.5. Site for Temporary Storage of Solid RAW in heavy weight tanks – "BC"

2.5.1. Solid RAW - class **2-** I

RAW volume towards 01.01.05 - 274 m^3

Physical components (vol. %) – textile (1%), metal (38%), filings (0%), wood (9%), construction debris (48%), polymers (0%), wadding (0%), rubber (0%), paper (0%), mixed (4%).

Processing

Processing done – 557 number of drums (200 l)

	Processed Wastes (vol. %)	Volume Reduction Factor
Pre-compaction	46	3
Super-compaction		
Packing		
Not treated	54	-

Radionuclides inventory [Bq/kg]:

$^{54}Mn – 2.10^3$	$^{110m}Ag110m – 2.10^2$
$^{59}Fe – 8.10^0$	$^{134}Cs – 7.10^3$
$^{58}Co – 1.10^2$	$^{137}Cs – 1.10^4$
$^{60}Co – 2.10^4$	$^{95}Nb – 8.10^0$

2.6. Storage Facility for Storage of Conditioned RAW – SFSC RAW

Package of the Conditioned RAW	***Number of Packages***
StBK-1	**128**
StBK-3-1 and StBK-3-3	**84**
Total	**212**

3. Research Reactor IRT-2000

Stored quantity: 84000 l

Characteristics: specific activity 84 Bq/l

4. Permanent Storage Facility for RAW Novi Han

4.1. Storage for Solid RAW

RAW volume: 120 m^3 untreated RAW;

Total buried activity: 6.58 x 10^{12} Bq;

Major radionuclides: ^{137}Cs (4.29 x 10^{12} Bq, 65,20%), ^{60}Co (8.63 x 10^{11} Bq, 13.2%), ^{90}Sr (7.71 x 10^{11} Bq, 11.72%), ^{14}C (3.70 x 10^{11} Bq, 5.62%), ^{3}H (2.42 x 10^{11} Bq, 3.68%) and minimum quantities ^{55}Fe, ^{65}Zn, ^{106}Ru, ^{134}Cs, ^{144}Ce, ^{204}Tl.

4.2. Storage for Solid Biological RAW

RAW Volume: 25 m^3 conditioned RAW;

Total buried activity: 1.65 x 10^{11} Bq;

Major radionuclides: ^{137}Cs (1.12 x 10^{11} Bq, 67.88%), ^{90}Sr (1.85 x 10^{10} Bq, 11.21%), ^{14}C (1.55 x 10^{10} Bq, 9.39%), ^{3}H (1.02 x 10^{10} Bq, 6.18%), ^{60}Co (8.28 x 10^{9} Bq, 5.02%) and minimum quantities of ^{65}Zn, ^{54}Mn, ^{106}Ru, ^{134}Cs, ^{144}Ce.

4.3. Storage for Sealed Sources

RAW Volume: 0.65 m^3 untreated RAW.

Total buried activity: 6.19 x 10^{13} Bq;

Major radionuclides: ^{137}Cs (5.39 x 10^{13} Bq, 87,08%) and ^{60}Co (7.09 x 10^{12} Bq, 11.45%), minimum quantities of ^{90}Sr (6.57 x 10^{10} Bq, 0.11%), ^{226}Ra (5.97 x 10^{11} Bq, 0.94%), ^{239}Pu (1.82 x 10^{11} Bq, 0.30%), ^{3}H, ^{22}Na, ^{55}Fe, ^{63}Ni, ^{85}Kr, ^{133}Ba, ^{147}Pm, ^{170}Tm, ^{204}Tl, ^{241}Am.

4.4. Engineering Trench for Solid RAW

RAW Volume: 100 m^3 untreated RAW;

Total buried activity: 1.04 x 10^{12} Bq;

Major radionuclides: ^{137}Cs (7.00 x 10^{11} Bq, 67.31%), ^{60}Co (1.84 x 10^{11} Bq, 17.69%), ^{90}Sr (1.54 x 10^{11} Bq, 14.81%).

4.5. Tanks for Temporary Storage of Liquid RAW

Stored quantity: 12 m^3;

Characteristics: solutions of ^{134}Cs, ^{137}Cs, ^{60}Co, ^{90}Sr with activity under the exempting limits;

4.6. Site for Storage of RAW in train containers

RAW Volume: 310 m^3 partially processed (dismantling, re-packing) RAW;

Total buried activity: 9.28 x 10^{13} Bq;

Major radionuclides: ^{241}Am (7.84 x 10^{13} Bq, 84.48%), ^{60}Co (1.13 x 10^{13} Bq, 12.18%), ^{239,238} Pu (2.18 x 10^{12} Bq, 2.34%), ^{85}Kr (1.03 x 10^{12} Bq, 1.11%) and minimum quantities of ^{3}H, ^{14}C, ^{36}Cl, ^{90}Sr, $^{241}Am/Be$, $^{241}Pu/Be$, $^{226}Ra/Be$;

4.7. Site for Storage of RAW in concrete receptacles type of "PEK", reinforced concrete containers StBKKUB and reinforced concrete containers StBKGOU

RAW Volume: 114 m^3 partially processed (dismantling, re-packing) RAW;

Total buried activity: 1.36 x 10^{15} Bq;

Major radionuclides: ^{60}Co (1.05 x 10^{15} Bq) and ^{137}Cs (3.15 x 10^{14} Bq) and minimum quantities ^{241}Am, ^{239}Pu, ^{3}H, ^{14}C, ^{85}Kr, ^{90}Sr, ^{232}Th, ^{252}Cf, $^{241}Am/Be$, $^{241}Pu/Be$.

4.8. Site for Storage of low active RAW

RAW Volume: 331,1 m^3 partially processed (dismantling, re-packing).

5. Uranium mining

5.1. Tailings pond "Buchovo – 1"

Quantity of held RAW: 1.3 millions m^3 tailings.

5.2. Tailings pond "Buchovo – 2"

Quantity of held RAW: 4.5 millions tons tailings and unknown quantity of solid RAW from the liquidation of "Metalurg" uranium milling plant.

5.3. Tailings pond Eleshnitsa

Quantity of held RAW: 9.0 millions tons tailings, 1700 m^3 spent ion-exchange resin and unknown quantity of solid RAW from the liquidation of "Zvezda" uranium milling plant;

Estimated activity: 1.5 x 10^{15} Bq.

Annex L-5

LIST OF THE INTERNATIONAL TREATIES, ACTS AND SECONDARY LEGISLATION APPLICABLE TO THE MANAGEMENT OF SPENT FUEL FACILITIES AND RADIOACTIVE WASTE FACILITIES

1. International Treaties and Agreements

1.1. JOINT CONVENTION on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

(ratified by Act of the 38th National Assembly on 10 May 2000 – State Gazette (SG) # 42/2000, published in SG # 63/2001, in force since 18 June 2001);

1.2. VIENNA CONVENTION on civil liability for nuclear damage;

1.3. CONVENTION on the physical protection of nuclear material;

1.4. CONVENTION on early notification of a nuclear accident;

1.5.CONVENTION on assistance in the case of a nuclear accident or radiological emergency;

1.6 CONVENTION on environmental impact assessment in a transboundary context, published in 1999, in force since 1997;

1.7 AGREEMENT between the Government of the Republic of Bulgaria and the Government of the Republic of Greece on operational notification in case of nuclear accident and exchange of information for nuclear facilities;

1.8 AGREEMENT between the Government of the Republic of Bulgaria and the Government of the Republic of Romania on operational notification in case of nuclear accident and exchange of information for nuclear facilities;

1.9 AGREEMENT between the Government of the Republic of Bulgaria and the Government of the Republic of Turkey on operational notification in case of nuclear accident and exchange of information for nuclear facilities;

1.10 AGREEMENT between the Committee on the Use of Atomic Energy for Peaceful Purposes of the Republic of Bulgaria and the Federal Regulatory Authority of Russia on Nuclear and Radiological Safety;

1.11 AGREEMENT between the Committee on the Use of Atomic Energy for Peaceful Purposes of the Republic of Bulgaria and the Ministry of Protection of the Environment and Nuclear Safety of the Ukraine in the domain of the state regulation and control on safety in the use of atomic energy for peaceful purposes;

1.12 AGREEMENT between the Government of the Republic of Bulgaria and the Government of the Russian Federation in the domain of peaceful use of atomic energy;

1.13 AGREEMENT between the Government of the Republic of Bulgaria and the Government of the Russian Federation in the domain of atomic energy sector;

1.14 AGREEMENT between the Committee on the Use of Atomic Energy for Peaceful Purposes of the Republic of Bulgaria and the Federal Ministry of the Environment, the Protection of Nature and the Reactor Safety of the Federal Republic of Germany.

2. Acts

2.1. Act on the Safe Use of Nuclear Energy (published in SG # 63/28.06.2002, ch.&add. # 120/29.12.2002, # 70/10.08.2004);

2.2. Act on Environmental Protection (published in SG # 91/25.09.2002, ch. SG # 98/18.10.2002, ch. SG # 86/30.09.2003, add. SG # 70/10.08.2004);

2.3. Act on the Public Health (published in SG # 70/10.08.2004, in force since 01.01.2005, add. SG # 46/03.06.2005);

2.4. Act on the Management of Crises (published in SG # 19/01.03.2005);

3. Secondary Legislation

3.1. Regulation for the basic norms for radiation protection (State Gazette # 73, 2004)

3.2 Regulation for providing the safety of spent nuclear fuel management (State Gazette # 71, 2004)

3.3 Regulation for safety of radioactive waste management (State Gazette # 72, 2004)

3.4 Regulation for safety of the decommissioning of nuclear facilities (State Gazette # 73, 2004)

3.5. Regulation for the conditions and procedure for transfer of radioactive waste to the state enterprise “Radioactive Waste” (State Gazette # 64, 2004)

3.6. Regulation for the procedure for assessment, collection, spending and control of the financial resources and definition of the amount of contributions due on the Nuclear Facilities Decommissioning Fund. (State Gazette # 112, 2003)

3.7. Regulation for the procedure for assessment, collection, spending and control of the financial resources and definition of the amount of contributions due on the Radioactive Waste Fund. (State Gazette # 112, 2003)

3.8. Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy

(State Gazette # 41, 2004)

3.9. Regulation for radiation protection during activities with sources of ionizing radiation (State Gazette # 74, 2004)

3.10. Regulation for providing the safety of nuclear power plants (State Gazette # 66, 2004)

3.11. Regulation of the conditions and procedure for notification of the NRA about events in nuclear facilities and sites with sources of ionizing radiation (State Gazette # 71, 2004)

3.12. Regulation of the conditions and procedure for exempting small amounts of nuclear material from the Vienna convention for civil liability for nuclear damage (State Gazette # 72, 2004)

3.13. Regulation of the conditions and procedure for acquiring professional qualification and for the procedure for issuing licenses for specialized training and certificates for qualification for use of nuclear energy (State Gazette # 74, 2004)

3.14. Regulation for emergency planning and emergency preparedness in case of nuclear and radiological accident (State Gazette # 71, 2004)

3.15. Regulation for providing of the physical protection of nuclear facilities, nuclear material and radioactive substances (State Gazette # 77, 2004)

3.16. Regulation of the conditions and procedure for establishing of zones with special statute around nuclear facilities and sites with sources of ionizing radiation (State Gazette #69, 2004)

3.17. Regulation for the conditions and procedure for gathering and submitting of information and keeping records of the activities subject to guarantees according to the Treaty on the Non-proliferation of Nuclear Weapons (State Gazette # 74, 2004)

3.18. Regulation on providing the safety of research nuclear installations (SG # 80/2004);

3.19. Regulation on the conditions and procedure for transportation of radioactive substances (SG # 60/2005);

3.20. Regulation on Safety and Radiation protection Requirements related to Liquidation the Results from Uranium Ore Industry (SG # 101/1999, ch. SG # 63/2001);

3.21. Regulation on the conditions and procedure for implementation of environmental impact assessment of investment proposals for construction, activities and technologies (SG # 25/2003);

3.22. Rules of Procedure of the NRA (State Gazette # 86, 2002), ch.& add. SG # 46/2005);

3.23. Regulation for the procedure for paying the fees ensuing by the Safe Use of Nuclear Energy Act. (State Gazette # 85, 2003)

3.24. Tariff for the fees collected by the NRA in accordance with the provisions of the Safe Use of Nuclear Energy Act (State Gazette # 85, 2003)

3.25. Regulation No 9 for establishment and maintenance of Public Register of the sites of public importance controlled by the Regional Inspectorates for Protection and Control of the Public Health (SG # 28/2005),

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Annex L-6

HUMAN AND FINANCIAL RECOURCES

I. Human Resources

Kozloduy NPP

The management of Kozloduy NPP demonstrates commitment according to the human resources in order to ensure:

- employment of the necessary qualified personnel according to the qualification requirements for each position;
- training for particular job position and maintaining the personnel qualification;
- employment of licensed experts, according to the requirements by the Low for Use of Nuclear Energy;

The functions on the preliminary selection, the professional selection, the training and the personnel qualification are differentiated in particular structural units in order to ensure independence of the assessment during the selection and the assessment of the training.

The administrative units with the assistance of the units, which the applicants are going to work at, perform the preliminary selection.

The training and the maintenance of the qualification is implemented by a particular structural unit – "Personnel and Training Centre" Division.

Basic factor for the personnel training and qualification in Kozloduy NPP is the effective specific training. The NPP Kozloduy Executive Director, the managers of the correspondent units and the manager of the "Personnel and Training Centre" Division are responsible for the personnel training.

The Kozloduy NPP Training Centre is situated on the NPP site. The Training Centre has the necessary contemporary equipment, which allows the implementation of all up-to-day training forms.

The criteria for, and the requirements to the training, the qualification and the licensing of the personnel, worked in the area of nuclear energy are fixed in the new regulation, vested in force on August, 24-th, 2004 – "Regulation for the conditions and the procedure for acquiring of professional qualification, and for the procedure for licensing for specific training, and personal licences for qualification for use of nuclear energy".

Professionally qualified and certified personnel only will perform, according the requirements of the LSUNE, the activities, related to the safety of nuclear facilities and to activities with sources of ionising radiation.

Kozloduy NPP implements the requirements to the personnel, fixed in the regulations, through a "System for personnel training and qualification". The system covers the organisation, the management, the implementation and the monitoring of the activities on personnel training and qualification, the structure and the functional responsibilities of the officials within the NPP organisational structure, the levels of the responsibilities and the interaction of the system elements in the activities realisation.

From qualification requirements point of view, the personnel, occupied with the radioactive wastes and spent fuel management is separated in three groups, as follows:

- group A – operational and management staff, subject to licensing by the Qualification Examination Commission;
- group B – managers, experts and executive staff within the Kozloduy NPP structural units, who are subject to examination on operation and are not included in group A;
- group C – managers, executive and auxiliary staff within the Kozloduy NPP structural units, who are not covered by groups A and B.

The Job Description for each particular job position describes in details the requirements to the qualification for the correspondent position. The job descriptions of the personnel, directly occupied with the radioactive wastes and spent fuel management are submitted to the Nuclear Regulatory Agency.

The Kozloduy NPP Director Executive approves all job descriptions and they are subject to review by the Nuclear Regulatory Agency.

The Nuclear Regulatory Agency applies clearly expressed policy for acknowledgement of the professional qualification of the personnel, working in the area of the use of the nuclear energy, which requires:

- lists of the positions, fixed in the licences for operation of the Kozloduy NPP's nuclear facilities, for which a specific training and licensing by the Qualification Examination Commission is required, according to LUNE;
- list of the positions occupied with the radioactive wastes and spent fuel management, approved by the Kozloduy NPP Executive Director, for which specific training and proof of the professional qualification for conducting of these activities are required. The list

should be prepared according to the requirements of the Regulation for the conditions and the procedure for acquiring of professional qualification and for the procedure for licensing for specific training and for use of nuclear energy;

- carrying out of examinations for the personnel, subject of licensing, according to the examinational syllabuses, approved by the Chairman of the Nuclear Regulatory Agency;
- nomination of Qualification Examination Commission by the Chairman of the Nuclear Regulatory Agency, with the agreement of the Minister of Health;
- the personal license is with a limited term – up to five years.

The personnel carrying out activities related to the ensuring and monitoring of the nuclear safety and radiation protection in the radioactive wastes and spent fuel management is with acknowledged licences by the Nuclear Regulatory Agency.

Sufficient number of qualified personnel covers all activities on radioactive wastes and spent fuel management. The number of the necessary personnel is defined by the job schedule, where the particular positions, their number, the lowest educational degree required for obtaining the position are identified.

In order to be ensured qualified and competent personnela selection system is implemented. This system ensures:

- check up of the compliance to the applicants' qualification with the qualification requirements for obtaining the positions;
- examination of the applicants' health status and a consequential assesment for permission for work in ionisation radiation environment;
- examination of the psycho-physiological characteristics of the personnel, which is related directly to the ensuring and monitoring of the activities on nuclear safety and radiation protection in the radioactive wastes and spent fuel management and which is subject to license acknowledgement by the NRA Qualification Examination Commission.

The personnel's training is implemented on the basis of developed standard training programmes, and the qualification assessment – on the basis of developed syllabuses for examination. The standard training programmes are developed for job and working position on the base of the necessary knowledge and skills, required by the personnel in order to execute the assigned working objectives and the requirements of the job descriptions.

The admission to single-handed work for the personnel, which is not subject to licence acknowledgement by the Qualification Examination Commission becomes after training and

certification (assessment in order to be confirmed the required qualification) by an internal departmental examination commissions. The staff, who is certified for particular position, passes re-certification after different period according to the particular position and the particular group of the personnel.

The applied system for training, maintenance and permanent development of the personnel's knowledge and skills,the use of contemporary and up-to-date methods, means and equipment is a warranty that the operation and maintenance of the Kozloduy NPP nuclear facilities is entrusted to a high-qualified personnel.

On the base of the above-mentioned, it may be considered that all conditions for ensuring with qualified personnel, necessary for the activities, related to the safety during the operational life time of the equipment for spent fuel and radioactive wastes, are met and this personnel is available.

Information for the personnel's education in the structural units of Kozloduy NPP, related to the spent fuel and radioactive wastes.

Structural unit	Basic functions	Total number	Higher education	Secondary education	Elementary education
Safety and Quality Department the personnel, subject to licensing is licensed by the Regulatory Body.	- methodological management, co-ordination and monitoring of the safety; - implementation of the regulatory requirements and increasing of safety culture; - independent monitoring of nuclear safety and radiation protection within the company; - metrological assurance and environment monitoring	**235**	**131** 55,74%	**103** 43,83 %	**1** 0.43 %
Department "Production" Division "Maintenance"	- production of electro-energy; - operation of spent fuel storage; - keeping the requirements of the technical specification in conformity with the requirements of the regulatory and supervisory	**302**	**57** 18.87%	**203** 67.21 %	**41** 13.57 %

Engineering Support Division	bodies; - operation of XTC; - effective management of the resources - engineering support of the spent fuel storage - planning, coordination and performance analysis of the production programme accomplishment;	**293,5**	**98** 33.39 %	**174** 59.28 %	**21** 7.16 %
"EP-1"	- operation of the nuclear facilities with VVER-440 reactors;	**1418**	**348** 24.54 %	**957** 67.48 %	**113** 7.97 %
"EP-2"	- operation of the nuclear facilities with VVER-1000 reactors	**1866**	**614** 32.9 %	**1201** 64.36 %	**51** 2.73 %
Spent Fuel Storage Div.	- operation of the spent fuel storage	**49**	**16** 32.65 %	**33** 67.35 %	**0** 0%
Department "Personnel and Training Centre"	- organises and implements the training activities; - monitoring of the qualification	**61**	**41** 34.04 %	**19** 26.38 %	**1** 1.64 %
Test Centre "Diagnostic and Control"	- basic metal and welding junctions status diagnostic and control	**72**	**40** 55.56 %	**32** 44.44 %	**0**

Nuclear Science Experimental Base (NSEB) of the Insistute for Nuclear Research and Nuclear Engineering at BAS

35 persons, including 14 with higher degree are available to NSEB towards June 2005. The requirements to the qualification are given in the job description for each particular working position.

The requirements to the personnel includes:

- secondary education with specialisation on mechanics, power engineering, electronics, locksmith's trade, turnery and other specialisation – for the technical staff;
- higher education with specialisation on nuclear engineering, nuclear physics, electro- and mechanical specialisation for the engineering staff;
- acquisition of additional qualification and obtaining of licence for work in radiation environment;
- additional training and qualification of the personnel for the particular occupied position.

Annually, a Training Program for upgrading the personnel qualification is developed, which is implemented both on-site and outside. The specific training includes:

- training on nuclear safety and radiation protection;
- familiarisation with the reactor systems, the equipment for manipulation with the nuclear fuel and the technological systems for transferring of the fuel from the reactor core into the reactor pool, the system for collecting and treatment of the liquid radioactive wastes, the procedures for their maintenance and repair;
- performing drills to handle the spent fuel and radioactive wastes;
- performing of exercises for action in emergency conditions;
- performing a preliminary and periodical instructions on industrial safety and radiation protection.

STATE ENTERPRISE "RAO" ("Radioactive Wastes")

In regards to the licence issued by NRA to SP "RAO" for operation of nuclear facility for radioactive wastes management, the licensee should hire people, meeting to the fixed professional and health requirements. The positions, which may be occupied only by people, who have obtained valid personal licences issued by the Chairman of NRA are fixed in Annex 5 to the license.

Towards 15th of June 2005, the SE "RAO" personnel consists of 206 people. They are separated in groups as follows:

Unit	Total Number	Higher Education	Secondary Education	Elementary Educatione
Headquarter of SE "RAO"	**21 people**	**19 people**	**2 people**	**-**
SE "RAO" - Kozloduy	**187 people**	**54 people**	**129 people**	**4 people**
Total:	**208 people**	**73 people**	**131 people**	**4 people**

Permanent Storage Facility for Radioactive Wastes (PSF RAW) – Novi Han

PSF RAW– Novi Han has qualified personnel, necessary for execution of the activities, related with the safety during the operation of the facilities for radioactive waste management. Selection of the personnel, in accordance to the criteria established in PSF RAW– Novi Han aims at:

⇒ limitation of personnel random selection

⇒ hiring of personnel with high professional qualification

⇒ appointing only people with health admission for work in radioactive area.

The total number of the staff is 61 people. From them 38 (62%) are with higher education in the area of nuclear physics, radio-chemistry and engineering specialisation, 23 (38%) are with secondary vocational education. Five of the staff are with post-graduate degree. Regarding the transport of radioactive substances, 30% of the total staff is qualified under the European Agreement for International Transport of Hazard Loads on Roads (ADR).

The personnel's qualification is upgrading, following a Procedure on Personnel Management, Training and Qualification, as a part of the PSF RAW– Novi Han Integrated System for Quality and Environment Management. The procedure is in conformity with the requirements of "Regulation for the conditions and the procedure for acquiring of professional qualification and the procedure for issuing licences for implementation of specific training and

qualification for use of nuclear energy". A part of the procedure on qualification upgrading is the participation in courses, seminars, scientific visits, and regional projects, organized by IAEA in the area of radioactive wastes safe management.

In order to be established a good social atmosphere and personnel motivation, the work in the following directions is in progress:

⇒ clear definition of qualification objectives, rights, responsibilities and interrelations;

⇒ adequate payment according to the responsibilities;

⇒ implementation of a social programme.

II. Financial Recourses

Kozloduy NPP

After the separation of Kozloduy NPP as an independent joint-stock company, the financial recourses for the costs for the spent fuel are ensured by the income from the sell out of the production, by credits and by donations.

The income from the sell out of the production ensures financial resources for covering the process of production. According to the approved "Strategic Plan for Safe and Effective Management of the Fuel Cycle in Kozloduy NPP", the costs for maintaining the safety of the facilities for spent fuel management, including the costs for the returning of the spent fuel for treatment in Russia, are part of the Kozloduy NPP production costs.

The company invests own resources, coming from the income and from the allowances for depreciation.

Since 1st of January 2003, the Regulations for fund "Decommissioning of Nuclear Facilities" and fund "Radioactive Wastes" have changed according to the Low for Safe Use of Nuclear Energy. The order and the procedure for financing of the activities on decommissioning of nuclear facilities and radioactive wastes management are settled in these regulations, and the principles for collecting and spending of the sources for the both funds are as follows:

The incomes are collected, accounted and centralised in the system of the united budgetary account, using separate transitive accounts, established to the Ministry of Energy and Energy Resources in Bulgarian Popular Bank and separate payment code in the system for electronic budgetary payments.

The funds are managed in a way, securing fulfilment of the annual program of the licensee, who posses permission for decommissioning of nuclear facility and the activities on radioactive wastes management.

The resources are spent for purpose only to finance the activities, fixed in the Low for Safe Use of Nuclear Energy, while the expenses from the both funds are provided annualy by the budget of the Ministry of Energy and Energy Resources.

The not disbursed part of the incoming resources, including resources from past years, is accounted off-balance. The interests, received from deposits in Bulgarian Popular Bank, after agreement between Minister of the Finances and the Minister of Energy and Energy Resources, are transferred in the accounts of fund "Decommissioning of Nuclear Facilities" and fund "Radioactive Wastes", in the account of the incomes by interests of the central budget.

The instalments in the both funds by juridical and physical persons are acknowledged as operating costs for the activity.

The accumulated resources for safety and for storage of radioactive wastes and for decommissioning of nuclear facilities, including those from the foregoing years, are transferred in transitive accounts, with holder of the Ministry of Energy and Energy Resources.

The resources of the funds are managed in the frame of the monitoring and management of the liquidity of the integrated account system.

Intentions:

Kozloduy NPP has made suggestion for actualisation of the Regulation for Decommissioning of Nuclear Facilities aiming at:

- revision of the assessment of the common prognosis expenses for decommissioning of the nuclear facilities, and for the spent fuel management, including its processing, which remains on site after the final operation of the last reactor;
- alteration of the amount of the Kozloduy NPP annual instalments, which may to be fixed on the basis of the prognosis expenses for погребване of radioactive wastes, produced as a result of the units' operation (or the prognosis expenses for decommissioning) and the designed life-time of the units and the collected to the moment resources in the funds;
- identification of the legal term when the funds for financing of the common expenses for decommissioning should be available.

The expenses for decommissioning of nuclear facilities and for maintenance of the facilities for radioactive waste management are financed by external organisations, as well

within the PHARE program fo0r nuclear safety continues financing of projects dealing with the activities for decommissioning and management of RAO.

The "Project for Management of the Kozloduy NPP Decommissioning Project" is financed by the IAEA's programme for technical assistance.

NSEB

The financial resources for maintaining the safety in spent fuel management by the research reactor is provided annually by the state budget.

SE "RAO"

The activities on radioactive wastes management from Kozloduy NPP are financed by the Fund "Radioactive wastes", and for this purpose a contract for financing between SE "RAO" and the Fund is signed.

PSF RAW– Novi Chan

The activities on radioactive wastes management from the Institute for Nuclear Research and Nuclear Energy in PSF RAW– Novi Han are financed by the Fund "Radioactive Wastes", and for this purpose a contract for financing between Institute for Nuclear Research and Nuclear Energy and SE "RAO" is concluding. The investment programme of PSF RAW– Novi Chan, related to the construction of new contemporary facilities for radioactive wastes management on the site of PSF RAW– Novi Han is financed with the resources of EC under the PHARE programme. Co-financing is provided by the fund "Radioactive wastes".