THE REPUBLIC OF BULGARIA

FOURTH 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, October 2011

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List of Abbreviations

AB – Auxiliary Building
ASUNE - Act on The Safe Use of Nuclear Energy
BAS – Bulgarian Academy of Science
BNRP – Regulation on the Basic Norms for Radiation Protection
CA – Controlled Area
CRAWS – Conditioned Radioactive Waste Storage Facility at the SE RAW – Kozloduy SD
DSFSF - Dry Spent Fuel Storage Facility
EBT – Emergency Boric Acid Tank
EC – Evaporator Concentrate (Liquid Radioactive Concentrate)
EIA - Environmental Impact Assessment
EPA – Environmental Protection Act
FSAR – Final Safety Analysis Report
HLRAW – High Level Radioactive Waste
HLST – High Level Sorbent Tank
IAEA – International Atomic Energy Agency
INRNE – Institute of Nuclear Research and Nuclear Energy
ISAR – Intermediate Safety Analysis Report
LLST – Low Level Sorbent Tank
NCRBRP – National Centre for Radiobiology and Radiation Protection
NF – Nuclear Facility
NPP – Nuclear Power Plant
NRA –Nuclear Regulatory Agency
NRRAW – National Repository for Low Level and Intermediate Level RAW
PD – Personal Dosimetry
PP – Power Production of Kozloduy NPP
QMS – Quality Management System
RAW – Radioactive Waste
RAWPW – Radioactive Waste Processing Workshop at the RAW – Kozloduy SD
RCC – Reinforced Concrete Container
RCCGIS - Reinforced Concrete Container For Gamma Irradiator Storage
RCCSS – Reinforced Concrete Container For Spent Sources Storage
RH – (Central) Reactor Hall
RPLC – Receipt and Preparation Laboratory Complex at SE RAW – Novi Han SD

RR – Research Reactor

SAR – Safety Analysis Report

SE RAW – Kozloduy SD – SE RAW – Kozloduy Specialized Department

SE RAW – Novi Han SD - SE RAW – Novi Han Specialized Department

SE RAW – State Enterprise “Radioactive Waste”

SF – Spent Fuel

SFP – Spent Fuel Pond

SIR – Sources Of Ionising Radiation

WSFSF – Wet Spent Fuel Storage Facility

WWER – Water Cooled Water Moderated Energy Reactor

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 in 2000 and has been in force in the Republic of Bulgaria as of 18 June 2001. In 2003 the Republic of Bulgaria prepared its First National Report that demonstrated the level of compliance with the Convention requirements, the achieved safety level of spent fuel and radioactive waste management as well as the planned activities.

The Second and Third National Reports of the Republic of Bulgaria presented the progress made by the country in the implementation of the Convention requirements. These Reports emphasized the changes occurring in the regulatory basis, the national infrastructure of spent fuel (SF) and radioactive waste (RAW) management, the status of the facilities, and the practical implementation of the normative and regulatory legislation.

The purpose of this Fourth National Report of the Republic of Bulgaria on the Joint Convention is to describe the results achieved in implementing the Convention provisions over the period since the third review meeting. In order to avoid repeating of information already included in the first three reports the Report emphasizes the changes in the primary legislation, the adoption of new national strategy, and the changes in the licensing status of the facilities.

The *Act on the Safe Use of Nuclear Energy (ASUNE)* and the secondary legislation regarding its application governs the public relations as regards the safety of spent nuclear fuel management and radioactive waste management. Over the period after the presentation of the previous report, the process of review and update of the law has been completed. In October 2010 a Law for Amendment of the ASUNE has been adopted and enforced. The Amendment considers the new EU legislation, the changes in the international conventions and treaties, the new or amended IAEA documents, as well as the gained experience in applying the law in practice. The work on preparation of regulatory guides also continued.

More than six years elapsed after the *Strategy for SF and RAW Management* has been approved in 2004 as a basic national document formulating the policy and principles of the safe management of spent fuel and radioactive waste. Most of the goals aimed, have been achieved. During this period a number of internal and external changes happened including: Republic of Bulgaria joined the EU, adoption of new European regulations and directives related to the SF and RAW safe management, and decision of the Council of Ministers for construction of a National Repository for Low Level and Intermediate Level RAW (NRRAW), decision of the Council of Ministers to declare the Kozloduy NPP units 1 and 2 as a RAW management facilities. These changes imposed the preparation of a new *Strategy for SF and RAW Management until 2030*, which has been adopted by the Council of Ministers in January 2011.

In March 2011 the construction of the Dry Spent Fuel Storage Facility (DSFSF) has finished. The application for issuance of a commissioning permit and the attached documentation are under review by the NRA now. The operating license of the Wet Spent Fuel Storage Facility (WSFSF) has been amended in September 2010 in connection with the preparation for loading of first dry storage casks.

During the reporting period the SF has been completely removed from the SF ponds of Kozloduy NPP units 1 and 2. In December 2008 these units have been declared as RAW management facilities by a decision of Council of Ministers and the SE RAW has been appointed as their operator. In 2010 the NRA Chairman has issued operating licenses for the units as RAW management facilities.

Over the period following the submission of the Third National Report the review and assessment of the presented by the applicant Technical Design of Belene NPP and the attached Intermediate Safety Analysis Report (ISAR) and Probabilistic Safety Analysis (PSA) report has begun. The compliance of the Technical Design with the legal and regulatory requirements, approved safety standards, and issued permits conditions, including in the area of SF and RAW management, is under assessment.

International cooperation in the field of SF and RAW management is of particular significance for the Republic of Bulgaria. Close contacts have been established with the regulatory authorities of the EU member countries. The Bulgarian government institutions, scientific organizations and operators of nuclear facilities generating SF and RAW take part in a number of international initiatives related to SF and RAW management. The programmes of IAEA and the European Commission have been of particular importance and significance to our country and Bulgaria will continue to actively participate in them.

This Report has been drafted in compliance with the *Guidelines Regarding The Form And Structure Of National Reports, INFCIRC/604, 19 July 2006*. Section B describes the policies and practices in the Republic of Bulgaria regarding management of SF and RAW, in accordance with the requirements of Article 32, paragraph 1 of the Convention. Section C presents the understanding of the Republic of Bulgaria for implementing the scope of the Convention to the situation in our country. Section D contains data on the facilities for management of SF and RAW and accounting of SF and RAW as provided in Article 32, paragraph 2. The application of Convention Articles 4 through 28 is described in Sections E through J. Section K reports on the fulfilment of safety enhancement activities planned in the first two National Reports and it also lists the future actions scheduled. Section L contains annexes to the Report that provide more details on some of the issues dealt with.

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."

Bulgarian policy of SF and RAW management

The policy of the Republic of Bulgaria regarding the management of SF and RAW is defined in the national legislation (mainly *ASUNE, Environmental Protection Act, Health Act*, and regulations for their application) and is focused to the following essentials:

- SF and RAW management is subject of state regulation and is carried out only by entities that have received licence and/or permit by the NRA Chairman;
- SF management is carried out only by entities that have received an operating licence for a nuclear facility;
- Assigning of responsibility to the entities generating RAW for their safe management until it has been transferred to the SE RAW;
- Establishing of state monopoly over the RAW management activities - RAW management outside the sites where they are generated is assigned to the SE RAW;
- The RAW generating organizations shall incur the costs for waste management, including its final disposal, following the principle "the contaminant pays";
- In the case of RAW with unknown owner, it is the State that bears the responsibility for its management;
- Ban on RAW import to the country except for the cases defined in the ASUNE (re-import of used sealed sources of ionising radiation (SIR) manufactured in the Republic of Bulgaria, and if the RAW is generated as a result of the processing of materials performed as a service in favour to the Republic of Bulgaria or a Bulgarian legal entity;
- Application of the principle for returning back of some categories SIR to the manufacturer after ceasing of their use;
- SF may be declared as a RAW when conditions are available for its safe storage and disposal in the respective repository, and if the operating organization has made the appropriate payment to the RAW Fund;
- The RAW should be duly processed until their transformation in the condition which ensures their safe storage and their disposal with the shortest possible delay after generation).

The Republic of Bulgaria pursues its policy in the area of SF and RAW management within the legal framework of the EU and in compliance with the obligations assumed as a signatory to the international conventions.

The policy of the Republic of Bulgaria regarding the management of SF and RAW is based on the moral principle of avoiding to impose undue burden on future generations. The principles of RAW and SF management were declared in the national *Strategy for Spent Nuclear Fuel and Radioactive Waste Management, 2004*, later confirmed and developed further in the *Strategy for SF and RAW Management until 2030*, adopted by the Council of Ministers in January 2011.

The *Strategy* defines the specific policies and main directions in long-term aspect for the management of:

SF fuel and high level RAW

- The SF fuel generated within the country is a material containing useful components. This material should be reprocessed in the fuel's country of origin or in third countries in an internationally acceptable and mutually beneficial economic, technological, and environmental friendly, manner;
- The SF whose reprocessing has been proven economically inexpedient, shall be defined as radioactive waste as per the procedure of the ASUNE, and may be managed under the concept of "deferred decision for subsequent use, if it is stored in a manner allowing its recovery;
- In the case of long-term storage under the "deferred decision" scenario, the SF should be stored using the dry cask storage technology;
- The deep geological repository is presumed to be a most suitable option for durably guaranteed safety in the isolation of highly active and long-life RAW;
- The country's involvement in regional and international projects for deep geological repository is deemed expedient while the search for international solutions should not jeopardize the current national programme.

RAW and decommissioning

- Minimization of the RAW generation, reuse and recycling of the waste, and exemption from regulatory control;
- Use of approved technologies for RAW processing and conditioning;
- Ensuring pre-emptive disposal of the waste in the long term plan, as compared to their accumulation;
- Management of disused radioactive source;
- The conditioned low- and intermediate level RAW, including waste from the decommissioning of nuclear facilities and waste from the other sectors of the national industry will be disposed in one national near-surface repository. The construction of a repository for disposal of low- and intermediate level RAW is the highest priority within the next 5 years;
- Decommissioning of Units 1 and 2 of Kozloduy NPP based on the "continuous dismantling" concept until reaching the state of "brown field" on the Kozloduy NPP site.

SF management practices

SF management in Kozloduy NPP

According to the design the SF in Kozloduy NPP is stored for a period of three years in the at-reactor ponds, following which it is transported back to Russia for processing. In 1985 a decision was passed that the reactor pond storage period for SF from WWER reactors should be increased from 3 to 5 years. This necessitated the construction of a wet storage facility on-site of Kozloduy NPP and it was commissioned in 1989.

In 1988, SF from WWER-440 was returned for the last time to Russia under the old contract conditions (free of charge), and since then all the SF from units 1-4 has been mainly transferred to the wet spent fuel storage facility (WSFSF) for temporary storage.

For the return of the SF from KNPP units 1-6 (initially supplied as fresh nuclear fuel up to 2002) a long-term framework agreements were signed with the Russian company OAO Techsnabexport in

1998 for WWER-440 and in 2000 for WWER-1000. Currently spent fuel is regularly transported to Russia under these contracts. For the SF originally supplied as fresh fuel after 2002, contracts have been placed with the Russian company OAO TVEL. By 31.07.2008 a total of 2607 spent fuel assemblies have been transported under the two long-term agreements (for SF from WWER-440 and WWER-1000).

The Nautilus barge transports SF for processing in Russia. The barge is equipped to transport 8 containers loaded with SF from WWER-440 (240 assemblies) or WWER-1000 (96 assemblies).

The SF from units 1-4 is stored in the at-reactor SF ponds by the time it is transferred to the WSFSF or to Russia. The at-reactor SF pond for WWER-440 assemblies is designed in two rows of racks: the upper row can be dismantled, while the lower one is fixed. Currently, units 3 and 4 hold operational licences for operation in E mode - storage of SF in the at-reactor ponds. The SF has been stored on two racks until the end of 2009 and after it is on lower rack only. In December 2009 the SF has been completely removed from the SF ponds of Kozloduy NPP units 1 and 2. Respectively they have been declared as RAW management facilities by a decision of Council of Ministers and the SE RAW has been appointed as their operator. In 2010 the NRA Chairman has issued operating licenses for the units as RAW management facilities to the SE RAW as a license holder. Because of the above reason the at-reactor SF ponds 1 and 2 have been removed from the list of the SF management facilities subject of this Report.

SF from units 5 and 6 is being stored in at-reactor ponds 5 and 6 pending its transport to Russia or to the WSFSF. The ponds are located in the containment of the respective unit. They consist of 4 parts and are physically separated by partition walls. Three parts are allocated for immediate storage of the SF assemblies, while the fourth part is used for transport and handling operations with fresh and spent fuel. The racks for storage of assemblies are inside the fuel storage areas.

The standalone spent fuel storage facility (WSFSF) on-site of Kozloduy NPP is a wet type, i.e. the fuel is stored underwater in four ponds. The spent fuel assemblies are arranged in transport baskets. In 2006 the storage facility was equipped with a refuelling machine for spent fuel from WWER-440 and WWER-1000.

SF management in long-term plan

The present fuel cycles of the units 5 and 6 envisage loading 42-48 fresh fuel assemblies each year. In order to ensure sufficient free space for emergency unloading of the reactor core it is necessary to ship 96 SF assemblies each year from one of the two units.
Until now the SF from units 5 and 6 is shipped mainly to Russia and in a lesser degree to WSFSF, which is used as intermediate storage.

It is envisaged that the SF from WWER-440 will be moved to the DSFSF, after its forthcoming commissioning expected in 2013, and/or will be shipped for processing. The capacity released will be used for temporary storage of the SF from WWER-1000.

More detailed information on the main technical characteristics and safety assurance in the at-reactor ponds 3-6 is provided in Section G of this Report and Annex L-1.

Construction of DSFSF

Pursuant to the national strategy for SF and RAW management, the Updated Decommissioning Strategy of KNPP Units 1-4, and the *Framework Agreement with EBRD for funding*, Stage 1 of the dry spent fuel storage facility is currently being built. This stage envisages storage of 2800 WWER-440 assemblies for a period of 50 years. The NRA Chairman has amended the construction permit for the DSFSF in order to allow construction of Stage 1a, which increases the capacity up to 5256 SF assemblies from WWER-440 reactors.

The storage technology will use a system of CONSTOR-440/84 casks cooled through natural air convection and having a load capacity of 84 assemblies. The casks will be loaded with spent fuel

and prepared for storage in the existing WSFSF. The capacity for handling and preparation for storage is 420 assemblies per year, which is equivalent to 5 CONSTOR-440/84 casks.

More detailed information on the main technical characteristics of the DSFSF and the licensing process is provided in Section G and Annex-1 of this Report.

SF of the research reactor IRT-2000 of the Bulgarian Academy of Science

Because of the complete removal of the SF from site in 2008 presented in the Third National Report, the research reactor is removed from the list of the SF management facilities, included in this Report.

RAW Management practices

The management of RAW is considered as:

a. Part of the practice for use of nuclear fuel for production of electricity. The spent fuel is not considered as RAW.
b. Part of the practice for use of radioactive sources in medicine, industry, agriculture and research. This practice includes operation of centralised facility for storage and treatment of institutional RAW.

The operators of nuclear facilities and the licensees for activities with other sources of ionising radiation (SIR) treat (to different extent) and store at the sites intermediate, till transfer to State Enterprise "Radioactive Waste (SE RAW) all generated RAW.

SE RAW, as an operator of NF for management of RAW, performs treatment and storage, and after construction of the national repository, will perform also the activities for disposal of conditioned RAW. Till the commissioning of the national repository for disposal, RAW are stored in interim storage facilities.

RAW management at Kozloduy NPP

The RAW generated at Kozloduy NPP is category 2 – low and intermediate level waste according to the categorization made in the *Regulation on the safety of RAW management.*

The design basis solution for RAW management in Kozloduy NPP consists of:

- Pretreatment and/or storage of solid RAW for the whole operation period till decommissioning of the nuclear facilities;
- Treatment of liquid radioactive solutions by evaporation and/or filtration, release in the environment of surplus waters (as authorised discharges) and storage of RAW (radioactive concentrates and spent sorbents) for the whole period of operation till the decommissioning of the nuclear facilities.
- Release to the environment as authorised discharges of gaseous radioactive substances after preliminary purification

The solid RAW in the controlled area are collected separately on places for conditionally "clean" wastes and places for RAW and are sorted according to the dose rate characteristic and the type of the material – mainly compactable and non-compactable.

The liquid RAW (radioactive concentrates and spent organic sorbents) are stored in separate tanks in the auxiliary buildings of KNPP.

After 2001 a general decision for the next stages of the management of RAW from KNPP-treatment, conditioning, and storage was taken - by the construction of a separate nuclear facility for RAW management, situated on the KNPP site. Operator of the facility for processing and storage of low and intermediate level solid and liquid RAW is RAW - Kozloduy SD of the SE RAW.

The treatment of compactable solid RAW ensures structural stability and volume decreasing in the preparation for conditioning. The waste is compacted in 200-l drums in two stages: pre-compaction applying 50-t in- drum compactor, followed by 910-t super compaction of the drums.. The processing of liquid wastes includes concentration by evaporation and conditioning by cementation. For packaging of RAW a reinforced concrete container is used with net volume of 5 m^3.

The packaging of the treated compactable solid RAW and non-compactable solid RAW is made depending of the radionuclide content :

- combined conditioning with the liquid RAW by including of the treated solid RAW in cement-radioactive matrix
- including of the treated solid RAW in cement non-radioactive matrix
- -packing of the treated solid RAW without immobilization in a matrix

The conditioned RAW are stored in storage with capacity of 1920 RAW packages.

Information about the main purpose and important characteristic of the sites for treatment of RAW is given in Annex L-3

The main characteristics of the stored RAW are given in Annex L-4.

Management of RAW from nuclear applications

At nearly 2000 different sites of national industry, medicine, agriculture and research institute ionising radiation sources (SIR) are used.

The spent sources, so-called "institutional" RAW are transferred to SE RAW – Novi Han SD without preliminary treatment. In SE RAW Novi Han the incoming RAW are processed by new commissioned installation for cementing, for abrasive decontamination, for reduction of the volume of the solid RAW by compaction. Due to the large number of fire detectors - over 100 000, mainly with Pu and Am sources - SE RAW – Novi Han SD has developed some technological solutions for reducing their volume and further placing in a fire-proof packages. In the storages conditioned and non-conditioned RAW are stored.

The low level contaminated liquid solutions that are stored at the site of the research reactor IRT-2000 (from radiochemistry laboratories, special sewage and spent fuel pool) have been recently transported to Kozloduy NPP for treatment.

The solid operational RAW, including spent SIR used in different laboratories at the INRNE are stored on a site near the reactor until the transportation to the SE RAW – Novi Han SD for treatment and/or storage.

RAW generated during the partial dismantling of the equipment of IRT-2000 are treated and stored packed in reinforced concrete containers type StBK at the site of the nuclear facility.

The conditioned RAW at the site of SE RAW- Novi Han SD are going to be stored till their transfer to the National disposal facility for low and intermediate level RAW from nuclear facilities and nuclear applications in accordance with the acceptance criteria.

Data on RAW generation and processing is presented in Article 11 of this Report, and regarding the radioactive discharges - in Article 24.

RAW from mining and processing of uranium

In the frames of uranium industry in the Republic of Bulgaria more than 40 mining sites and two hydrometallurgical plants have been operating. Over 20 million tones of waste with increased content of natural radionuclides has been generated, and it has been stored in 3 tailings ponds and nearly 300 back water ponds. In 1992, uranium mining was suspended with a decision of the Government of the Republic of Bulgaria.

The measures in the field of uranium industry have been directed to eliminating the consequences from mining and processing of uranium ore within the framework of environmental management. The main objective is to rehabilitate the environment in the areas of the closed uranium mining sites and eliminate the public health risks in these regions.

RAW from uranium industry are stored in trenches in the waste heaps or the tailings ponds. Disposal is allowed in mining sites of uranium extracting sites. All technologies and disposal sites are defined together with the designs for technical liquidation and remediation.

RAW definition and classification criteria

The Second National Report presented the RAW classification as per the *Regulation on the safe management of radioactive waste*. It has been highlighted that the system for classification is oriented towards the disposal of RAW. The RAW categories are as follows:

1. Category 1 – transitional RAW that may be cleared following suitable treatment and/or temporary storage for a period of not more than 5 years during which their specific activity decreases below the clearance levels.

2. Category 2 – low and intermediate level waste containing radionuclide concentrations that do not require special measures for heat removal during storage and final disposal; this radwaste category is further subdivided into as follows:

a) category 2a – short-lived low and intermediate level waste that contain mainly short-lived radionuclides (with a half life period shorter or equal to that of Cs-137), and long-lived alpha radionuclides with a specific activity lower or equivalent to 4×10^6 Bq/кg for each package, and lower or equivalent to 4×10^5 Bq/кg for the entire RAW volume;

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

3. Category 3 – high level waste with radionuclide concentration such that it requires heat release to be considered for the purpose of storage and disposal.

For the purpose of RAW management before disposal the RAW-generating organizations may introduce additional categorizations that are subject to review and approval by the regulatory body. Such additional categorization process that takes into account the specificity of the RAW processing techniques applied has already been adopted at KNPP, the RAW – Kozloduy SD.

The following additional categories are applied, defined by the dose rate at 0.1 m distance from the surface of solid RAW

2-I from 1μSv/h to 0.3 mSv/h

2-II- from 0.3 mSv/h to 10 mSv/h

2-III- over 10 mSv/h

For the liquid RAW the following additional categories are introduced depending of the activity concentration:

2-H- less than 4.10^5 Bq/l

2-C-from 4.10^5 to 8.10^7 Bq/l

2-B- over 8.10^7 Bq/l

SECTION C. AREA OF APPLICATION

The entire spent nuclear fuel quantity on the territory of our country falls within the scope of the Convention.

The radioactive waste containing radioactive substances of natural origin only, generated outside the nuclear fuel cycle, except for the sealed radioactive sources, is not declared as radioactive waste for the purpose of this Convention.

RAW from nuclear applications on sites of the Ministry of Defence are managed as civil nuclear applications programmes and are declared for the purpose 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

The Republic of Bulgaria has the following SF management facilities with the respective SF quantities and characteristics (by 31.12.2010):

Facilities of Kozloduy NPP Plc.

SF reactor storage at unit 3 (Reactor pond - 3)
Location: the central reactor hall of units 3 and 4, adjacent to unit 3;
Purpose: storage of SF from unit 3;
Storage method: under water in two racks;
Storage capacity (number of assemblies): 728
SF stored (number of assemblies/kg heavy metal): 365 pcs./42 205 kg

SF reactor storage at unit 4 (Reactor pond - 4)
Location: the central reactor hall of units 3 and 4, adjacent to unit 4;
Purpose: storage of SF from unit 4;
Storage method: under water in two racks;
Storage capacity (number of assemblies): 726
SF stored (number of assemblies/kg heavy metal): 373 pcs./43 475 kg

SF reactor storage at unit 5 (Reactor pond - 5)
Location: the central reactor hall of units 5, adjacent to the unit;
Purpose: storage of SF from unit 5;
Storage method: under water in one rack;
Storage capacity (number of assemblies): 612
SF stored (number of assemblies/kg heavy metal): 307 pcs./ 120 426 kg

SF reactor storage at unit 6 (Reactor pond - 6)
Location: the central reactor hall of units 6, adjacent to the unit;
Purpose: storage of SF from unit 6;
Storage method: under water in one rack;

Storage capacity (number of assemblies): 612
SF stored (number of assemblies/kg heavy metal): 365 pcs./ 143 925 kg

Standalone wet spent fuel storage facility (WSFSF)
Location: On-site of KNPP, close to units 3 and 4;
Purpose: to store SF from all reactors on site;
Storage method: under water, in a pool divided in 4 sections;
Capacity (number of baskets): 168 or under specific conditions - 200
SF stored (number of assemblies/kg heavy metal): 4614 pcs./560 138 kg

Standalone dry spent fuel storage facility (DSFSF)
(under commissioning)
Location: On-site of KNPP, adjacent to the WSFSF;
Purpose: long-term storage of SF from WWER-440 reactors;
Storage method: dry, in steel-concrete casks type CONSTOR 440/;
Capacity (number of casks): 78
SF stored (number of assemblies/kg heavy metal): 0 pcs./ 0 kg

More detailed information regarding the SF management facilities and the accounting of SF has been provided in Annexes L-1 and L-2 of the report.

Facilities for RAW management

In the Republic of Bulgaria, there are the following facilities for RAW management including characteristics and amounts of RAW in them at 31.12.2010, namely:

Facilities of Kozloduy NPP Plc.

Auxiliary Building - 1
Location: a separate building located closely to KNPP units 1 and 2;
Purpose: processing of liquid RAW and storage of solid and liquid RAW;
Processing methods: evaporation, filtration;
Storage capacity / volume of the solid RAW stored, m^3:1010 / 300
Storage capacity / volume of the liquid RAW stored, m^3:
Liquid radioactive concentrate: 2350 / 2000
Spent sorbents 1076 / 368
Since October 2010 the facility operator is SE RAW

Auxiliary Building -2
Location: a separate building located closely to KNPP units 3 and 4;
Purpose: processing of liquid RAW and storage of solid and liquid RAW;
Processing methods: evaporation, filtration;
Storage capacity / volume of the solid RAW stored, m^3: 1010 / 219.7
Storage capacity / volume of the liquid RAW stored, m^3:
Liquid radioactive concentrate : 2350 / 1900
Spent sorbents 1076 / 238

Auxiliary Building - 3
Location: a separate building located closely to KNPP units 5 and 6;
Purpose: processing of liquid RAW and storage of solid and liquid RAW;
Processing methods: evaporation, filtration;
Storage capacity / volume of the solid RAW stored m^3: 2486+ 213 / 764.4
Storage capacity / volume of the liquid RAW stored, m^3:
Liquid radioactive concentrate : 3600 / 2045
Spent sorbents: 200/134

Storage facility in Reactor Hall – 1 (RH-1)
Location: in the reactor hall of units 1 and 2
Purpose: storage of operational solid RAW category 2, additional category 2-III
Type of stored RAW : not treated
Capacity of the storage facility/volume of the stored solid RAW, m^3: 81.6 / 52
Since October 2010 the facility operator is SE RAW

Storage facility in Reactor Hall – 2 (RH-2)
Location: in the reactor hall of units 3 and 4
Purpose: storage of operational solid RAW category 2 , additional category 2-III
Type of stored RAW : not treated
Capacity of the storage facility/volume of the stored solid RAW, m^3: 81.6 / 32

Facilities of SE RAW– RAW - Kozloduy SD

RAW processing plant (RAWPP)
Location: on the site of KNPP, close to Auxiliary building-3;
Purpose: treatment and conditioning of solid and liquid RAW category 2;
Processing methods: compaction of solid RAW and evaporation of liquid RAW; chemical and electrochemical decontamination of metal RAW
Conditioning methods: immobilization in cement matrix, packaging in a reinforced concrete container.
Capacity of treatment of RAW, m^3 / year: liquid – 450 / solid – 1500

Storage facility for conditioned RAW
Location: on the site of KNPP, closely to RAWPP;
Purpose: interim storage of conditioned RAW class 2a, ;
Storage facility capacity / volume of the RAW packages stored: 1920 / 1035

Trench storage facility
Location: the Lime Plant on-site of KNPP;
Purpose: temporary storage of processed and non-processed solid RAW class 2-I and 2-II;
Storage facility capacity / volume of the RAW stored, m^3 :3860/2744

Storage facility for processed solid RAW
Location: the Lime Plant on-site of KNPP;
Purpose: temporary storage of treated solid RAW class 2-I and 2-II;
Storage facility capacity / volume of the RAW stored, m^3: 1130 / 374

Sites (№1 и №2) for storage of solid RAW in reinforced concrete containers
Location: the Lime Plant on-site of KNPP;
Purpose: Buffer interim storage processed solid RAW of class2-I and 2-II, packaged in reinforced concrete containers;
Storage facility capacity / volume of the packages RAW stored: 2000 / 272.

Site for storage of solid RAW in freight containers
Location: the Lime Plant on-site of KNPP;
Purpose: Buffer storage of low-active treated and non-treated solid RAW class 2-I in ISO- standard containers;
Storage / volume of the RAW stored, m^3: 420/ 180.

Storage facility for contaminated soil
Location: the Lime Plant on-site of KNPP;
Purpose: storage of soil, construction and other bulk technological waste with very low level of contamination;
Storage facility capacity / volume of the RAW stored, m^3: about 8000 m^3 / 0

Facilities of the SE RAW – Novi Han SD

Storage facility for solid RAW
Purpose: storage of non conditioned solid low and intermediate radioactive short lived RAW, class 2a.
Capacity/ volume of the stored m^3 RAW: 237 / 80

Storage facility for biological RAW
Purpose: storage of conditioned low and intermediate level biological waste, after treatment with formaldehyde and immobilization in a gypsum matrix, class 2a
Capacity/volume of the stored RAW, m^3: 80 / 64

Storage facility for spent sealed sources
Purpose: storage of non conditioned spent sealed sources, class 2a and 2b
Capacity/ volume of the stored RAW, m^3: 1 / 0.65

Engineering trench for solid RAW
Purpose: storage of non conditioned low and intermediate level solid waste, class 2a
Capacity /volume of the stored RAW, m^3: 200 / 160

Storage for liquid RAW Purpose: storage of low active short lived liquid wastes
Capacity/volume of stored RAW, m^3: 48 / 48

Site No 1 and 1A for storage of solid RAW
Purpose: storage of solid wasteclasses 2a and 2b in ISO- freight containers
Capacity /volume of the stored RAW, m^3: 442 / 310

Site No 2 for storage of solid RAW
Purpose: storage of solid RAW classes 2a and 2b in reinforced concrete containers different type
Capacity /volume of the stored RAW: 7 concrete PEK containers, 171 RCCCube reinforced concrete containers for sealed sources, 60 reinforced concrete containers StBK, 18 type GOU (reinforced concrete container for storage of gamma irradiators)

Site No 4 for storage of low level RAW
Purpose: storage of low level activity RAW, classes 1, 2a and 2b in 200 l metal drums
Capacity /volume of the stored RAW, m^3: 80 / 76

Complex for processing of RAW
Location: on-site of Novi han SD;
Purpose: characterization and processing of solid waste category 1, 2a and 2b and liquid radioactive solutions
Method of treatment: fragmentation, compaction AW, evaporation of liquid RAW, abrasive decontamination of metal RAW
Method of conditioning: cementing of solid and liquid RAW, packaging of solid RAW

Facilities of the INRNE - BAS

Storage for reactor equipment
Location: separate building on-site of the research reactor IRT-2000
Purpose: storage of operational low level solid RAW class 2
Capacity/volume of stored packages, number of packages: for the whole term of operation of IRT-2000 / 6 pieces of 200 l drums

Site for storage of solid RAW in reinforced concrete containers
Location: at the site of IRT-2000
Purpose: storage of treated solid RAW from the partial dismantling, category 2, packed in RCC
Capacity/number of stored packages: 14 / 6

Facilities of closed uranium mining

Buhovo-1 tailings pond
Location: 1 km east from the town of Buhovo;
Purpose: storage of the tailings generated as a result from the activity of the Metalurg Hydrometallurgy Plant in Buhovo, from 1956 to 1960;
Capacity/ Volume of the stored RAW, Mm^3: 1.3 /1.3.

Buhovo-2 tailings pond
Location: 1 km east from the town of Buhovo;
Purpose: storage of the tailings generated as a result from the activity of the Metalurg Hydrometallurgy Plant in Buhovo, from 1960 to 1992;
Capacity/ Volume of the stored RAWM M m^3: 10 / 4.5 Mt

Eleshnitsa tailings pond
Location: 3.0 km south-east from the village of Eleshnitsa;
Purpose: storage of the tailings arising from the activity of the Zvezda Hydrometallurgy Plant in the village of Eleshnitsa;
Capacity/ Volume of the stored RAW: 23.1 ha / 9 Mt

Installation for mine water treatment at the Chora site
Location: Close to the town of Buhovo;
Purpose: Purification of uranium contaminated mine pit water;
Processing methods: Ion exchange.

Installation for mine water treatment at the Byalata Voda site
Location: 30 km west from the town of Dolna Banya;
Purpose: Purification of uranium contaminated mine pit water;
Processing methods: Ion exchange.

Installation for mine water treatment at the Iskra site
Location: 10 km northwest from the town of Novi Iskar;
Purpose: Purification of uranium contaminated mine pit water;
Processing methods: Ion exchange.

Line for regeneration of ion-exchange resins
Location: On-site of the former uranium processing plant Zvezda, approximately 30 km south from the village Eleshnitsa;
Purpose: Regeneration of the anion exchangers, used at the water treatment installations for uranium contaminated mine pit water at the Chora, Byalata Voda and Iskra mining areas.

More detailed information regarding the RAW management facilities and the accounting of RAW in storage and in disposal facilities is provided in Annexes L-3 and L-4 of the Report.

Nuclear facilities in decommissioning

There are no nuclear facilities in Bulgaria that have license for decommissioning.

The operation of the first 4 units at KNPP has been ceased. They are at different stages of transition from status of operation to decommissioning.

Unit 1 and 2 have a license for operation as facilities for management of RAW. There is no spent fuel in the Units, they treat the historical RAW and the necessary preparatory work for decommissioning is ongoing, such as development of relevant documentation and preparing of the necessary decommissioning equipment and measuring devices.

Units 3 and 4 have a license for operation in E mode (the nuclear fuel has been removed from the core and kept in the reactor ponds). In compliance with the current licenses, units 1 - 4 of Kozloduy NPP can not be used for energy generation and the activities related to them are limited to storage of irradiated and spent nuclear fuel at the reactors spent fuel ponds and preparatory activities for partial dismantling of non-contaminated equipment.

Detailed information on the upcoming decommissioning of these units is presented in this Report, in article 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."

Brief review of the information, presented within the frames of the previous National Reports

Legislative and regulatory framework in the field of use of nuclear energy for peaceful purposes in the Republic of Bulgaria has been described in previous three National reports. The Act on the Safe Use of Nuclear Energy (ASUNE) and the Act on Public Health, as well as the regulations for implementation of the ASUNE (21 regulations) have been presented. The requirements for issuing of permits and licenses as well as the responsibilities of the NRA chairman, related to the issuance, amendment, renewal and withdrawal of such permits and licenses has been presented in details.

The state control requirements for management of radioactive waste and management of spent fuel have been described including these related to the NRA's inspection activities, enforcement administrative measures and the administrative penalties for violations in the field of nuclear safety and radiation protection.

The main participants in the process of RAW and SF management on national level (Council of Ministers, NRA, SE RAW and its specialized units, holders of permits and licenses) have been described, including the relationship between them as specified by the legislation.

The amendments made to a number of regulations in the period 2003-2005 and the intentions for amendment of the ASUNE have also been presented.

The activities related to harmonisation of the regulatory requirements in WENRA Member States have been described in details.

Changes in the legislative and regulatory framework

The main change in the period after presentation of Third National Report is the adoption of amendments to the ASUNE in October 2010.

In applying the policy of NRA for periodical review of the legislation in the field of nuclear safety and radiation protection, in the period 2007-2010 a draft amendment to the ASUNE has been elaborated. This amendment has been adopted by the Parliament and has been enforced on 15.10.2010. The amendment reflected the new EU legislation, the changes in the international

conventions and treaties, the new or amended IAEA documents, as well as the gained experience in applying the law in practice. The main changes and supplements are in the following areas:

- Harmonization of the provisions for the transboundary transport of SF and RAW with Directive 2006/117/;
- Introduction of decommissioning license which shall replace the issuance of series of permits and which guarantees the preservation of license holder responsibility during a long period of time;
- Creation of legal possibility that a NPP or parts of it to be declared as RAW management facility under condition that the SF is finally removed form the facility;
- Creation of legal possibility for the SE RAW to perform decommissioning of nuclear facilities after the respective license is issued;
- Changes in the methods for accumulation and spending of the resources in the Nuclear Facilities Decommissioning Fund and Radioactive Waste Fund and also change in funds' management;
- Facilitation of the licensing regime for import and export of radioactive substances;
- Improvement of the national system for the management of orphan sources including financing of these activities;
- Harmonisation with the ratified *Agreement between the European Atomic Energy Community (Euratom) and non-member States of the European Union on the participation of the latter in the Community arrangements for the early exchange of information in the event of radiological emergency (ECURIE)*;
- Transposition of the *Council Directive 2009/71/ Euratom establishing a Community framework for the nuclear safety of nuclear installations*;
- Introducing the main safety principles established by the *IAEA SF-1 "Safety Fundamentals"*;
- Correction of deficiencies related to the shift of the responsibilities in case of transfer of ownership or bankruptcy;
- Taking into consideration the changes in CPPNM;
- Changes in the legal provisions concerning the NRA's inspection activities, enforcement administrative measures and the administrative penalties for violations in the field of nuclear safety and radiation protection resulting from gained experience in applying the law in practice.

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

Planned amendments to the secondary legislation for application of the ASUNE.

The adoption of the amendments to the ASUNE requires a review of a large part of the secondary legislation for its application. For that purpose a schedule has been adopted with a deadline on 31.12.2012.

Guides for implementation of the regulations

NRA continues the development of the guides for implementation of the regulations. Most priority guides (mentioned in the Second National Report) have been drafted and have been discussed with the operators. The following guides have been elaborated, adopted, published and enforced until now:

- Manual for Performance of Deterministic Safety Assessment;

- Manual for Performance of Probabilistic Safety Assessment;
- Structure and content of Nuclear Power Plant Decommissioning Plan;
- Structure and content of the SAR of Centralized Storage Facilities for Low and intermediate level RAW;
- Radiation Protection During Decommissioning;
- Management System for Facilities and Activities;
- Procedure for Response in Case of Illicit Trafficking or Unauthorized Removal of Nuclear and/or Radioactive Materials;
- Procedure for Emergency Response in Case of Illicit Trafficking of Radioactive Materials in the Area of Border Checkpoints;
- Guide on Prevention, Detection and Response to Radiation Emergency with Radioactive Material in Metal Scrap.

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 previous National Reports

The previous National Reports explain that, in accordance to the provisions of the ASUNE, the state regulation of the safe use of nuclear energy and ionising radiation and the safe management of radioactive waste and spent fuel is exercised by the NRA chairman, an independent specialized authority of the executive power, having competence, determined by the 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 co-coordinator for preparation of the national reports on the fulfilment 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 personnel and financing is given. The advisory councils on nuclear safety and radiation protection, establish 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 Economy and Energy, conducting the state policy in the field of RAW and SF management, are also described.

Legislation changes, related to the regulatory body

By amendments to the ASUNE enforced in October 2010 the provision of adequate resources to the regulatory body has been stated as a main principle in Article 3. It is pointed out that the competent authority implementing the State regulation of the safe use of nuclear energy and ionising radiation shall be provided with human and financial resources sufficient to thoroughly fulfil its responsibilities.

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

Changes in the functions and organisational structure of the NRA have not been performed after the presentation of the Third National Report. According to the *Rules of Procedure of the NRA* the Agency disposes of 114 job positions. At the end of 2010 94 job positions were occupied of which 78 as civil servants.

In 2010 because of retirement the number of occupied job positions in the agency has decreased compared to 2009 by 10 employees, of which four occupied managerial positions. This led to changes in the age distribution of the employees, the largest percentage of employed workers are now being in the age groups between 31 and 50 years of age.

Age/Positions	21-30	31-40	41-50	51-60	over 60	Общо
Management	-	-	8	9	5	22
Expert	5	21	19	15	9	69
Technical	1	1	-	1	-	3
Total for NRA	6	22	27	25	14	94
Percentage	6 %	23 %	29 %	37 %	15 %	100 %

The implemented in the agency policy for transfer of knowledge and skills by the more experienced to the younger employees ensures the succession in the organization and the preservation of the well-established professional practices.
Almost all expert positions (98%) are occupied by employees with higher education – Master's degree, and some of them have a scientific degree "doctor". As a whole, 89% of all employees have higher education, and the rest of the employees - 11% have secondary education. The employees with higher education are mainly in the field of technical and natural sciences. The ratio of managerial positions held by women and men, as well as expert positions (56:44 in favour of women) is being kept the same.

The professional selection of personnel for the NRA is carried out in compliance with the requirements of the Act on Civil Servant, the Code of Labour and the Regulation on conducting competitions for appointment of civil servants. The requirements towards the candidates are focused not only on their professional competence, but also on the personal qualities of candidates, the ability for teamwork, the desire for development, communication skills, leadership, and managerial competence – for managerial positions and others.

The common training of the NRA employees is conducted in the form of training courses and seminars in different aspects of administrative activity. The Institute of Public Administration and European Integration conducts the training according to annual plan. The employees appointed in the state administration for the first time, undergo a training course entitled "Introduction in Civil Service" which is part of the professional development training. The foreign language training is focused on the development and improvement of communication skills of employees, based on specialized lexis and facilitating communication with EU institutions.

The specialized training of the NRA employees conducts NRA's Personnel Training Center opened in 2003. 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, and the development of the secondary legislation in accordance with the ASUNE and the European legislation.

The performance appraisal of the employees is performed according to the *Regulation on the conditions and order for performance appraisal of employees in the state administration*. The results from the performance appraisal in 2010 show that 27% of the employees received Grade 2 "Performance is above the requirements" and 73 % received Grade 3 "Performance corresponds to

An average of four employees each year have graduated successfully in foreign languages courses.

NRA Financing

The revenue of the NRA represents income from taxes collected under the ASUNE and the *Tariff of Taxes collected by the NRA under ASUNE*.

The *Law on the State Budget of the Republic of Bulgaria for 2010* determined the NRA income from state fees to 11,000,000 BGN. During the 2010 the NRA budget income from state fees amounts to 8,299,617 BGN, and the income from interests and penalties amounts to 17,782 BGN. The revenue part of the NRA budget has not been fulfilled to the prescribed by the *Law on the State Budget* size as a result of planned but not received taxes for issuing permits for construction of the two power units at the Belene NPP (to the amount of 4 million BGN).

The *Law on the State Budget* determines for the NRA expenditure amounting to 5,173,826 BGN. Following an amendment to the law the expenditure of the Agency has been optimized to 4,139,061 BGN and additional expenditure has been approved for the budget of the Agency to the amount of 1,316,760 BGN for financing expert evaluations of the Belene NPP project. Following the above mentioned corrections the total amount of the expenditure according to a specified plan amounts to 5,502,150 BGN, and the actual spent amount - 5,490,725 BGN.

Based on the economic situation and the measures taken by the government to combat the financial crisis, the Agency has taken the necessary steps to streamline and reduce costs in 2010.

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."

Brief review of the information, presented within the frame of the previous National Reports

The ASUNE requirements, related to the RAW and SF management activities is presented. It is stated that the radioactive waste management and spent fuel management is executed solely by legal entities 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.

It is pointed out that according to the legislative provisions (art. 73 of ASUNE) the state takes the ownership when the owner of the spent fuel or radioactive waste cannot be identified.

The requirements of the secondary legislation concerning responsibility of the licence holder are also presented.

Legislation changes, related to responsibility of the licence holder

A number of amendments have been made in the general part of the ASUNE considering transposition of *Council Directive 2009/71/ Euratom establishing a Community framework for the nuclear safety of nuclear installations* and introducing the main safety principles established by the *IAEA SF-1 "Safety Fundamentals"*. It is stated in Article 3 that responsibility for ensuring nuclear safety and radiation protection rests entirely with the persons responsible for facilities and activities (licensees), and may not be delegated to other persons.

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."

Brief Review of the information, presented within the frame previous National Reports

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 RAW management facilities have been presented. The system for qualification and performance of specialized training of NF personnel has been presented.

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 RAW management facilities have been described. Correspondingly, information on the human and financial resources of the operator of SF and RAW management facilities has been appended.

The legislative changes, related to the availability of human and financial resources have been described. It is pointed out that 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 application, and by which he certifies the availability of sufficient human and financial resources. Within the scope of the licensing 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 provisions of 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* has been presented concerning:

- the conditions and procedure for acquisition of professional qualification for activities in nuclear facilities and with sources of ionising radiation;
- the procedure for qualification acquisition;
- the procedure 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.

Information for the status of the Nuclear Facilities Decommissioning Fund and Radioactive Waste Fund and prognosis for the accumulation and spending has been presented too.

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

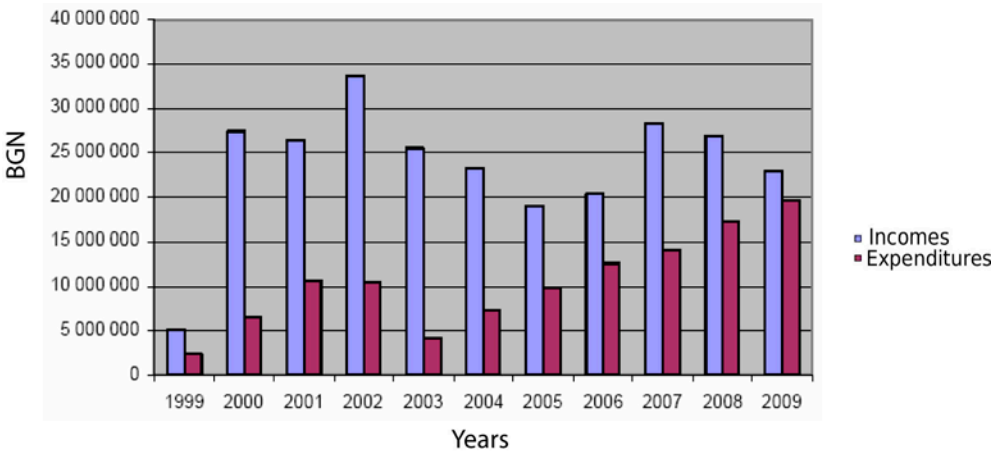
By amendments enforced in October 2010 the provisions of ASUNE (Part VII of Chapter Three) concerning qualification and specialised training have been changed taking into account the experience gained during application of the law in practice. Changes have been made in the methods for accumulation and spending of the resources in the Nuclear Facilities Decommissioning Fund and Radioactive Waste Fund and also change in funds' management.

Financing of Decommissioning and RW management

The operator provides the financing of the SF and RAW management during the facilities operation. The Nuclear Facilities Decommissioning Fund and Radioactive Waste Fund provide the financing of the decommissioning and management of RAW after their transfer to SE "RAW". The Funds are purposive, they are managed according to the valid legal regulations in order to ensure:

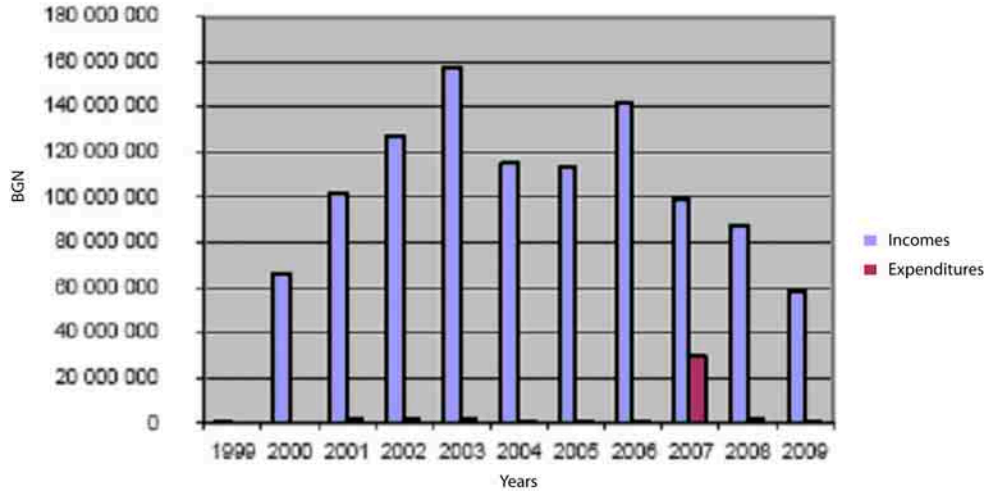
- availability of sufficient assets in order to avoid imposing of undue burdens to the future generations;
- equitable proportional distribution of the SF and RAW management expenditures among their sources;
- effectiveness of the expenditures for the management of SF and RAW
- transparency in the assets management which warrants that they will not be diverted illegally for other purposes.

According to the present legislation the expenditures of the Radioactive Waste Fund depend on terms of planned activities in the current *Strategy for SF and RAW Management until 2030* and current annual programmes of the SE RAW. The assets accumulated in the fund will be expended during an unlimited period. The data for Radioactive Waste Fund's income and expenditures in Bulgarian leva are presented on the chart below by years. About 145 millions BGN have been accumulated in the fund by the end of 2010.



Currently 95% of the assets accumulated are Kozloduy NPP contributions as a facility with highest share of RAW generation. In case of constant electricity production, amount of contribution and electricity price about 105 millions BGN revenues are expected during the next five years.

The data for Nuclear Facilities Decommissioning Fund's income and expenditures in Bulgarian leva are presented on the chart below by years. 1,053,895,650 BGN have been accumulated in the fund by the end of 2010.



In case of constant electricity production, amount of contribution about 275 millions BGN revenues are expected during next five years.

Information on the Nuclear Facilities Decommissioning Fund and the asset activity of the Fund is presented in the texts on Article 26 and Annex L-7

Information on the practical application of this Article by the operators of SF and RW management facilities is presented in Annex 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."

Brief Review of the information, presented within the frame of the previous National Reports

The First National Report has presented the ASUNE requirements for the persons conducting activities of radioactive waste 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 NRA controls the implementation of the quality assurance program during the regulatory inspections. Information on the quality management systems in place in Kozloduy NPP, SE RAW - Novi Han SD and the research reactor of BAS is presented.

In the frame of the Second National Report the Legislation changes, related to the quality assurance have presented. The provisions of the *Regulation for providing the safety of spent nuclear fuel management* and *Regulation for Safety of Radioactive Waste Management* concerning the mandate of the license holders quality assurance programs (QAP) have been pointed out. It is stated that in the *Regulation on the Procedure for Issuing Licences and Permits for Safe Use of Nuclear Energy* the requirements for presentation of Quality Assurance Programme together with application for different kinds of permits and licenses.

In the Third National Report the quality management systems of operating organisations have been presented.

Quality assurance programs of the operating organizations

Quality assurance at Kozloduy NPP

The Kozloduy NPP PLC at its capacity as the operating organization and holder of operating licenses and permits, elaborates, introduces and sustains a quality management system as a tool for activities/processes management during electricity production. After the substituation of the *IAEA Safety Series No.50-C/SG-Q* with the *GS-R-3 Management System for Facilities and Activities Safety Requirements* the Kozloduy NPP has taken the necessary measures to migrate to integrated management system according to the requirements of that new standard.

In 21.10.2009 a *Quality Management Handbook in Kozloduy NPP* has been introduced considering the requirements of:

- *EN ISO 9001 Quality Management Systems. Requirements*;
- *GS-R-3 Management System for Facilities and Activities Safety Requirements*;
- *ISO 14001:2004 Systems for environmental management*;
- *OHSAS 18001 Occupational Health and Safety Management Systems*.

At the end of 2009 a *Concept for Set Up of integrated management system in Kozloduy NPP* has been elaborated and introduced to define the method for transition to integrated management system. After the *Concept* introduction a *Programme for Transition to Integrated Management System in Kozloduy NPP* has been developed. The concrete activities and resources during the transition are defined in the programme. This transition programme is under implementation now.

The documentation of the quality management system includes:

- Kozloduy NPP Policies;
- Description of the Quality Management System;
- Organisational structure;
- Functions, responsibilities, powers and relations in the organisational hierarchy;

- Activities/processes and accompanied documentation in where management, control and work activities are described.

The safe management of SF and RAW are declared as a basic commitment of the management in its *Declaration About Long-term Intentions for Company Management*.

"Realisation and control of the SF and RAW management" has been pointed out in the document *"Safety Policy in Kozloduy NPP"* as one of the strategic goals.

The commitments and strategic goals mentioned above have been developed in the *Quality Management Handbook in Kozloduy NPP*, quality assurance programmes of different departments and other management documents like:

- *Programme for Maintaining and Improving the Safety in Kozloduy NPP during 2011, 2012, and 2013. Revision 9*;
- *Quality Assurance Programme for Safe Operation of WSFSF. Revision 2;*
- *SF Management Programme. Revision 3*;
- *Complex Programme for RAW Management in Kozloduy NPP. Revision 5*.

The requirements of the leading documents are reflected in the work documents through the quality management system, so the company personnel is familiar with the SF and RAW management requirements.

The management system documents are maintained up to date by the mechanisms of documentation management which ensures that the personnel uses the necessary documents, that: are adequately reviewed, approved according to the rules, are last revision, and all amendments and changes are included.

During the period after presentation of the Third National Report due to the changes in the international standards a significant part or the leading documents has been revised including:

- new revision of the *Declaration About Long-term Intentions for Company Management;*
- new revision of the *Management System Handbook in Kozloduy NPP;*
- new revision of the quality assurance programmes of the WSFSF and EP-2;
- update of the *Safety Policy in Kozloduy NPP*;
- update of the *Programme for Maintaining and Improving the Safety in Kozloduy NPP;*
- update of the *Complex Programme for RAW Management in Kozloduy NPP*

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

During the period after presentation of the Third National Report the Integrated Management System has been maintained. The requirements of ISO 9001:2000 and ISO 14 001:2000 standards have been reflected. The main processes have been elaborated.

Quality assurance at SE RAW

The quality management system, existing in SE RAW is developed according to the BDS EN ISO 9001:2001 and the IAEA documents 50-C/SG-Q, taking into account the requirements of the BDS EN ISO 14001:2005 for environmental management and BDS EN ISO 10006:2003 for project management..

The policy on quality, main principles and requirements for implementation of the basic and supporting processes has been described in the *Quality Management Manual of the State Enterprise RAW*. The specific processes of all departments are described in their Quality management programs, developed in compliance with the requirements of the Bulgarian legislation on RAW management and the IAEA documents 50-C/SG-Q.

After the replacement of IAEA Safety Standard 50-C/SG-Q with the Standard GS-R-3" System for Management of Facilities and Activities" SE RAW is developing together with external consultant a project for implementation of management system based on GS-R-3.

A Guidance of the management system is developed. On the basis of the developed processes and algorithm are determined the basic and additional documents. The structure of the documentation is the following:

- Management System Manual –, each chapter describes a whole determined process and links to instructions for stepwise implementation of the process;
- Procedures – general name of documents, that describe the activities of the basic processes
- Instructions – general name of documents that describe the stages or separate activities from a process or sub process. In this group two types of instructions have been considered: managerial and technological. The managerial Instructions assist towards the implementation of the enterprise's management processes and the technological cover the operational and maintenance activities.
- Check lists and records – forms to the Manual's chapters or instructions that after putting the information in them become evidences for the preformed activities.

During the preparation of the QMS of the enterprise, efforts were made to implement systematically the process approach, as recommended in IAEA documents, taking into account the national legislative requirements in the nuclear area - radioactive waste management, environmental management and public health and industrial safety.

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 frames of the previous National reports

The legislation in the field of radiation protection in Republic of Bulgaria has been presented, in which the internationally acknowledged principles of justification of practices, optimization of exposure and establishment of limits for occupational exposure. are applied.

The general requirements to the licensees and license holders and the basic principles, norms and rules for ensuring of radiation protection, that apply in the facilities and activities in the nuclear field, are determined in the ASUNE, Regulation on Basic Standards for Radiation Protection (RBSRP), Regulation on Safety of Nuclear Facilities and Regulation on Radiation Protection in Activities with SIR. All the regulations are available, including in English language, on the web-site of the NRA – http://www.bnra.bg.

The Regulation on the Basic Standards for Radiation Protection establishes the exposure limits:

For workers:

- an effective dose of 100 mSv for 5 consecutive years, with maximum effective annual dose less than 50 mSv;
- the limits for the annual equivalent doses keeping the limits for the effective doses are: 150 mSv for eye lenses; 500 mSv for the skin (this limit is for the average dose ,received by every surface with an area of 1 cm^2, regardless of the area of the irradiated surface); 500 mSv for the hands, forearms, feet and ankles.
- additionally requirements for the exposure of women during pregnancy or breastfeeding are introduced.

For the population:

- annual individual effective dose of 1 mSv;
- an annual effective dose of 5 mSv may be allowed only in extraordinary circumstances and with condition that the average effective dose for 5 consecutive years does not exceed 1 mSv;
- limits for annual equivalent doses, keeping the limit for annual effective dose for the population, are the following: for eye lenses - 15 mSv, for the skin - 50 mSv (this limit is for the average dose, received by every surface with an area of 1cm^2, regardless of the area of the irradiated surface)

Measures for not exceeding the dose limits and for optimisation of radiation protection

With the aim for not exceeding the dose limits and for application of the principle of radiation protection optimisation, RBSRP regulates the determination and justification of dose constraints for exposure from different sources. Such dose limitations are introduced in the Regulation on Safety during Management of RAW – 0.3 mSv/y from RAW disposal facility after closure.

An obligation of the operator of NF in implementation of RBSRP is to apply practical approaches for keeping the occupational exposure of the workers and the population ALARA. Implementing these legislative requirements, the regulatory body sets in the issued licenses detailed conditions for management of the activities - specification, planning, education, fed back from the operational experience. With the permanent regulatory control for implementation of the conditions of licenses is created a practical mechanism for guaranteeing the application of these legislative requirements.

A good practice of the NF operators last year is the introducing of administrative control levels for the individual dose for their staff – from 8 to 12 mSv for KNPP and SE RAW in 2010 year. Such administrative levels and the collective dose prognosis for the NF are important instruments in the process of optimisation of the occupational exposure. The established ALARA councils and the involvement of managers at all levels show the engagement of the management in the process. The result is a clear tendency of decreasing of the exposure of the staff at sustainable low levels.

Measures for preventing of unplanned and uncontrolled release of radioactive materials

In the RBSRP and the Regulation on radiation protection in activities with SIR are determined the measures for preventing of unplanned and uncontrolled release of radioactive materials in the environment .

For the nuclear facilities are introduced requirement for zoning of the sites and rooms where the exposure can exceed 1 mSv annually or the equivalent dose to reach 1/10 of the dose limits for the eye lens, skin and extremities taking into account the dose rate, surface contamination or contamination of the air. The requirements for the air flows directions, velocity, under-pressure, for access to and for the control for non-spreading of radioactive contamination at the boundaries of the zones, are specified in details.

The levels for release from regulatory control of the materials- unconditional clearance and release of metals for recycling, are determined in the regulations (by specific activity for the individual radionuclides).

According to art. 11 of The Regulation on management of RAW , deliberate dilution of RAW with intention to release from control is not permitted.

Measures for limiting releases

The allowed activity concentration levels for the liquid and gaseous releases are not determined in the legislation but they are approved by NRA for each individual nuclear facility and nuclear site. The levels of the allowed releases in the environment are determined based of the dose constrains for the population and are approved by the Minister of Health also.

The annual exposure as a result of liquid and gaseous releases during normal operation of NPP is limited according to The Regulation on Ensuring of Safety of Nuclear Power Plants from all nuclear facilities for the site as a whole to 150 μSv/y for new NF and to 250 μSv/y for the existing facilities.

The technical specifications of NF of KNPP, containing the operational limits and conditions, include also the levels for the radioactive releases to the environment during normal operation. With the introduced activity concentration levels for the liquid and gaseous releases it is guaranteed, that the exposure of the population is kept below 50 μSv/y.

An adequate system for monitoring of the liquid and gaseous releases is established. Information for the system is given in the previous reports on the Convention and in the Report of Republic of Bulgaria on art.35 of EURATOM Treaty, where the radiation monitoring nets for the environment of the licensees and information for the radiation monitoring of the central governmental bodies are presented.

Corrective measures in case of unplanned and uncontrolled release of radioactive materials

The system for radiation monitoring of the liquid and gaseous discharges is constructed to function during normal operation of NF for management of SF and RAW and also for the cases of deviation from normal operation and accidents. In such cases the operator is obliged to apply the relevant emergency procedures and/or emergency plans for mitigation and liquidation of the consequences from them, as it is presented under Article 25 of this report.

Operational experience after the presentation of the Third National Report

In the frames of the established licensing regime for NF the radiation protection is assessed by analyses of the doses from external and internal exposure of the staff and the population, received at operation of the nuclear facilities and the number of the persons, exposed above the established limits; radioactive contaminations of the environment, observing the radiation protection standards and rules .

The detailed information for the radiation exposure of the population and the workers in KNPP, SE RAW and INRNE-BAS by the operation of the facilities for management of RAW, presented in the previous national reports, is actualised with the data for the period 2008 – 2010.

Kozloduy NPP

Exposure of the personnel

The control of radiation doses from external and internal exposure is performed by Control Centre ”Personal Dosimetry” accredited in 2009 by the Executive Agency ”Bulgarian Accreditation Service”.

The main measurement method for external exposure doses is thermo-luminescent with threshold 0.10 mSv. For the purposes of the operational control dosimeters with direct reading and sensitivity 0.01 mSv are used.

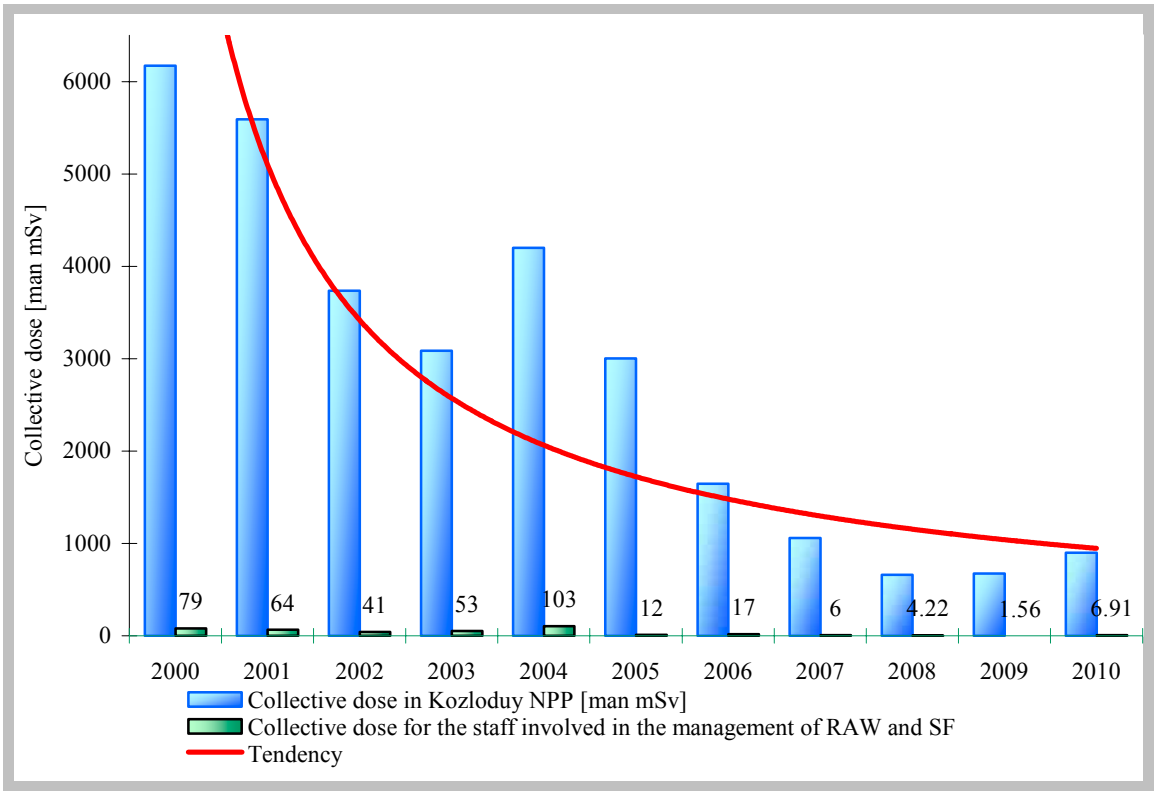
For the internal exposure an in-vivo method of measurement is used, including gamma-spectrometry determination of the incorporated activity and subsequent assessment of the intake and dose with computer codes for application of the ICRP bio kinetic models. The minimum detectable level of activity for the whole body counting is 200 - 300 Bq depending on the radionuclide. The accepted level of registration for the single separate determination is 1 mSv for external and 0.20 mSv for internal exposure, as stated by the *Regulation 32 on the conditions and the order for performing of the individual dosimetric control of the persons, working with sources of ionizing radiation.*

Last 13 years there is not registered an individual annual dose above the limit for occupational exposure – 50 mSv, and individual dose exceeding 100 mSv for 5 consecutive years.

For the period 2008-2010 the exposure of the personnel (own and contractors) involved in the management of SF and RAW in the restricted areas of KNPP is as follows:

Year	2008		2009		2010	
	SF	RAW	SF	RAW	SF	RAW
Collective effective dose [man.mSv]	0.46	3.67	0.67	0.89	3.14	3.77
Average individual dose [mSv]	0.002	0.12	0.004	00.03	0.02	0.12
Maximum individual dose [mSv]	0.21	0.72	0.14	0.4	0.54	0.75

For the period 2000 – 2010 the collective effective dose for workers, involved in the activities of SF and RAW management in KNAPP, is compared to the collective effective dose in KNPP



After the year 2000 the annual collective dose follows the tendency towards decreasing and reaching the levels around 5 man.mSv during recent years. There is no violation of the dose limits,

the values show a reached stable status of enough low level, that is an indicator for the degree of the optimization of the radiation protection in the SF and RAW management activities in KNPP.

Releases from the site of Kozloduy NPP

Summarized data for the gaseous and liquid releases in the environment

The monitoring of the gaseous and liquid releases from Kozloduy NPP and their reporting is in compliance with the requirements of European Commission Recommendation 2004/2/EURATOM.

The activity released through the ventilation stacks of Kozloduy NPP for the period 2008-2010 is the following:

Gaseous emissions	2008	2009	2010
Radioactive Noble Gases, TBq	0.55	0.66	6.43
Iodine-131, GBq	0.0011	0.0056	0.066
Radioactive aerosols, GBq	0.019	0.063	0.028
H-3, GBq	NA	NA	376
C-14, GBq	NA	NA	519

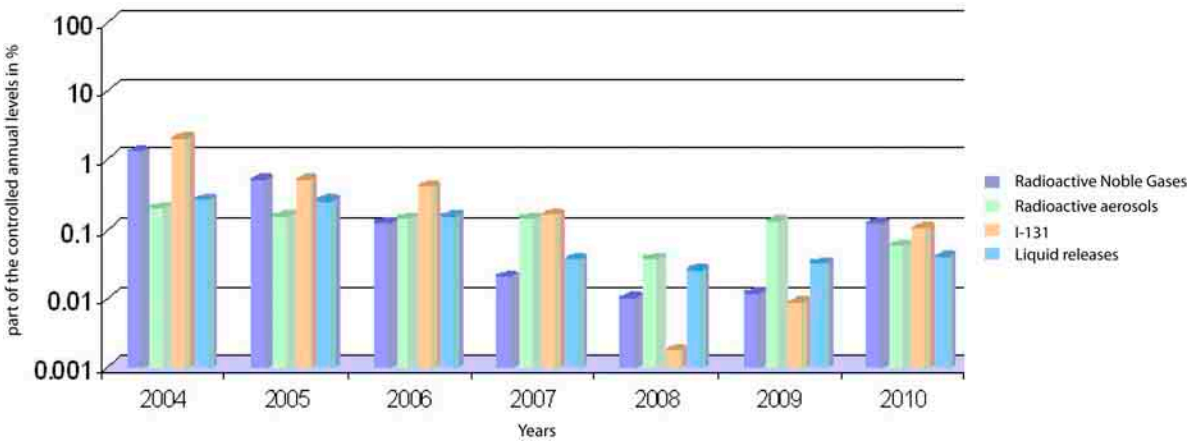
Monitoring of ^{3}H and ^{14}C in the gaseous releases from KNPP is performed since 2010. With the aim of the implementation of the requirements of art.45 of Directive 96/29/EURATOM for the years 2008 and 2009 prognosticated releases of ^{3}H and ^{14}C in the atmosphere have been accepted on the basis of the generated energy by Kozloduy NPP and the data published in Appendix C of the Report UNSCEAR'2000 for the distribution of the releases for reactors type PWR. These data are used in the assessment of dose exposure of the population.

For the period 2008-2010 the liquid discharged in Danube river have the following volume and activity:

Year	2008	2009	2010
Volume, m	49 900	41 800	41 300
Activity, MBq *Without tritium*	186	247	289
^{3}H, GBq	18 774	23 739	22 700

The registered releases of ^{3}H during last 3 years are from 7 to 13 % of the allowed value. The released with the liquid discharges activity (without tritium) is kept steady at the reached level.

For the period 2004-2010 the total activity of the gaseous and liquid releases as part of the controlled annual levels in % is as follows:



The released from KNPP radioactivity with the gaseous and liquid discharges is compatible with the usual practice in other countries operating reactors type WWER.

Due to the fact that SE RAW-Kozloduy SD is situated at the site of Kozloduy NPP, the liquid and gaseous discharges are released through the facilities of Kozloduy NPP and registered together, the information for the measured values is included in the reports of Kozloduy NPP.

Assessment of the dose exposure of the population from liquid and gaseous releases

For the assessment of additional dose exposure of the population resulting from the radioactive discharges, verified and validated code for assessment, based on the adopted by the European Union methodology CRAEM is used and adapted to the relevant geographical and hydrological characteristics of the region of KNPP.

The additional dose exposure of the population in 30 км zone is around 500 times lower than that one from the natural radiation background (2400 μSv). During the past 10 years the maximum value of the annual individual effective dose for the population varies in the range of 2.5- 5 μSv.

The values of maximum individual dose from gaseous releases from KNPP site, taking into account the contribution of ^{3}H and ^{14}C is the following:

Year	Maximum Dose RNG+ RA+ ^{131}I, Sv	Maximum dose ^{3}H, Sv	**Maximum dose** ^{14}C, Sv	Maximum dose total, Sv
2007	$1{,}43.10^{-8}$	$4{,}36.10^{-8}$	$4{,}05.10^{-7}$	$4{,}54.10^{-7}$
2008	$3{,}09.10^{-9}$	$5{,}39.10^{-8}$	$5{,}01.10^{-7}$	$5{,}58.10^{-7}$
2009	$1{,}17.10^{-8}$	$5{,}20.10^{-8}$	$4{,}82.10^{-7}$	$5{,}46.10^{-7}$
2010	$3{,}90.10^{-9}$	$5{,}63.10^{-9}$	$7{,}88.10^{-7}$	$8{,}02.10^{-7}$

For the years 2007, 2008 and 2009 the dose exposure from ^{3}H and ^{14}C is assessed on the basis of prognostic data for the releases. For 2010 year the dose exposure from ^{3}H and ^{14}C is assessed on the basis of real measurements of the released in the environment quantities.

Year	Liquid releases	
	Individual effective dose [Sv]	
	max. 30 км zone	Critical group
2005	$4{,}61.10^{-7}$	$3{,}29.10^{-6}$
2006	$5{,}33.10^{-7}$	$3{,}77.10^{-6}$
2007	$5{,}84.10^{-7}$	$4{,}12.10^{-6}$
2008	$4{,}94.10^{-7}$	$3{,}48.10^{-6}$
2009	$6{,}27.10^{-7}$	$4{,}41.10^{-6}$
2010	$6{,}00.10^{-7}$	$4{,}23.10^{-6}$

The maximum individual effective dose for 2010 in 30 km zone is $6{,}00.10^{-7}$ Sv/a, for a member of the critical group of the population around Danube river is $4.23.10^{-6}$ Sv/a and is 8.5 % from the dose constrains for liquid releases(0.05 mSv/a).

The low levels of the radioactive releases from KNPP determine exposure with negligible radiation risk for the population in the region of the plant.

SE RAW-

Occupational exposure of the personnel.

In the period 2005-2010 there is no exceeding of the legislative and administrative limits for occupational exposure. Incorporation of radionuclides for the persons as a result of the activities on RAW management is not registered. In accordance with ALARA principle during the reported period the exposure of the personnel is kept at level, significantly lower than the dose limits for occupational exposure.

The maximum annual individual effective dose last year is 5.5 mSv for SE RAW-Kozloduy SD and around 4 mSv for SE RAW-Novi han SD that is 11% from the annual limit for the occupational exposure according to RBSRP.

Below are given data for the collective effective dose, average individual dose and maximum individual dose for the staff of SE RAW for the period 2005-2010. that show the tendency of optimisation of the occupational exposure.

Exposure of SE RAW-Kozloduy SD personnel

Year	2005	2006	2007	2008	2009	2010
Collective effective dose [man.mSv]	106.7	69	72	74	51.4	35.1
Average individual dose [mSv]	0.64	0.43	0.45	0.40	0.33	0.22
Maximum individual dose [mSv]	5.5	04.7	4.76	3.7	4.0	2.2

Exposure of SE RAW-Novi han SD personnel

Year	2005	2006	2007	2008	2009	2010
Collective effective dose [man.mSv]	87.42	78.51	99.89	5.85	9.55	5.41
Average individual dose [mSv]	1.86	1.4	1.85	0.13	0.19	0.11
Maximum individual dose [mSv]	3.05	3.52	2.43	0.11	0.11	0.12

There are no direct gaseous and liquid releases from SE RAW-Kozloduy SD to the environment. As mentioned above, their release is through the relevant facilities of Kozloduy NPP and are included in the Kozloduy NPP reports for the releases.

Technologically from SE RAW-Kozloduy SD there are no releases of radioactive noble gases, short lived aerosols and Iodine-131. The part of the facility for management of RAW in the gaseous releases from the whole the KNPP site is less 0.1% at full load of the facilities. The doses for the population from the operation of the SE RAW-Kozloduy SD are included in the evaluation of the total radiological impact on the population from all the facilities at the site. The analysis of the results from the monitoring of the facilities of RAW –Kozloduy SD show that the radiation impact as a result of RAW management is negligibly small. There are not registered non-acceptable impacts on the environment.

In SE RAW – Novi Han SD a radiation monitoring is performed with monthly measurement of: water samples from control boreholes; soil and vegetation sample from the radiation protection zone and the surveillance zone; gaseous measurements at the RAW storage site.

According to the results of the National Centre for Radiobiology and Radiation Protection for the two years of investigation (autumn 2008-summer 2010) the assessed annual dose for any person from the population resulting from RAW – Novi Han SD activities is less than 0.01 mSv.

Research Reactor IRT of INRNE -BAS

Occupational exposure of the personnel

Below are presented the results for the total occupational exposure of the personnel dealing with the management of radioactive waste and spent fuel for the period 2008-2010

	SF	RAW
Collective effective dose [man.mSv]	0.124	2.154
Average individual dose [mSv]	0.010	0.127
Maximum individual dose [mSv]	0.015	0.518

Radioactive releases in the environment

After the shutdown of the reactor in 1989 the control of the releases has been stopped. In implementation of the Nuclear Regulatory Agency requirement, in 2007 the monitoring of airborne radioactivity in the NF is restored. The measurements in the air in reactor hall show activity concentration of alpha emitters in the interval – 2.10^{-4} – 3.10^{-2} Bq/m^3, for beta-emitter – $0{,}6.10^{-2}$ – 1,6 Bq/m^3.

The summarized results during operation of nuclear facilities for management of radioactive waste and spent fuel for the period 2008-2010 show that:

- Exceeding of the established dose limits are not registered;
- The collective effective dose for the personnel is in compliance with the preliminary dose budgets;
- The individual occupational exposure dose is about ten times lower than the established limits for occupational exposure in the RBSRP;
- The SF and RAW management activities cause negligibly small doses for the population in the region, in comparison with the natural radiation background;
- Non-authorized releases in the environment from the SF and RAW management are not registered.

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."

Brief review of the information presented within the previous National Reports

The requirements of the ASUNE for the developing and maintaining of on-site emergency plans of the nuclear facilities and off-site emergency plans functioning on a national level are presented. These plans contain the obligations of the operators and the competent state licensing authorities, the arrangements made regarding the emergency planning and preparedness and requirements for periodic inspection of the plans.

It has been pointed out that individuals that perform activities in connection with RAW and SF management shall take action to prevent incidents or accidents, and restrict or remedy the consequences from them. The action taken for emergency planning and maintenance of emergency preparedness are determined by emergency plans as follows:

- Off-site (national) emergency plan for protection of the public in the event of a nuclear or radiation accident;
- On-site emergency plans for each nuclear facility including emergency plans for the respective ministries, institutions and local administrative and local self-government authorities.

The *Regulation on emergency planning and emergency preparedness in case of nuclear and radiation accident is presented*, which defines the principles, the order and criteria for applying of protection measures and actions intended to limit, decrease and avert radiation exposure or the likelihood of it. The regulation defines the intervention levels in terms of values of the projected dose and the avertable dose for a set period of time, the dose rate and specific activity on achieving of which protection measures start to be implemented and analysis of the causes that have led to this condition is made.

Also information has been presented on the existing on-site and off-site emergency plans, the emergency response trainings held in 1996 – 2008, and the participation of the country in international projects on emergency planning.

The main statements of the *Disaster Protection Act* are presented.

The systems for emergency planning and preparedness of NF are presented and information for the performed emergency trainings is given.

Amendments to the legislative basis

In connection to the closure of Ministry of Emergency Situations, some changes in *Disaster Protection Act* are made. Establishment of a common rescue system for protection in case of disasters, including incidents and accidents happened in management of SF and RAW, is stated. The definition for disaster given in this law includes incidents and accidents occurring during the management of RAW and SF. The Council of Ministers performs the state policy in the field of disaster protection, such as:

- implements the common management of the disaster protection
- accepts the National programme for disaster protection and annual plans for its implementation
- accepts the National plan for disaster protection (National Emergency Plan)
- introduces National system for early notification and information for the authorities and the population in disasters and determines with a regulation the conditions and order of its functioning
- foresees financial resources for disaster protection

The last amendment of the National emergency plan is approved by decision 120 of the Council of Ministers dated 12 March 2010. The external emergency plan in case of accident in KNPP is part (part III) of the National Emergency Plan

In the external emergency plan the obligations, the responsibilities, and the rights of ministries and institutions that have relationship with the management of activities in nuclear or radiation accidents are regulated.

The main functions of the competent state authorities, responsible for ensuring radiation protection, having obligations for emergency planning, emergency preparedness and response in nuclear or radiation accident are as follows:

- NRA gives to the citizens, legal persons and state authorities objective information for the status of nuclear safety and radiation protection, collects and analyses the information for the accident and informs the international organisation;
- General Directorate ”Fire safety and protection in the population” of the Ministry of Interior manages the activities, related to emergency planning, emergency response and keeping the emergency preparation for protection of the population in disasters;
- Ministry of Health in emergency situation performs assessment of the doses and consequences for the population and orders application of protective measures (iodine prophylaxis) and others;
- Ministry of Environment manages the national system for control of the environment and performs the radio-ecological monitoring;
- Ministry of Agriculture and Food performs special control of the radioactivity in the agricultural production.

Basic part of the common rescue system is the General Directorate “Fire safety and protection of the population” in the Ministry of Interior, regional directorates of the Ministry of Interior, and the centres for emergency health care. The structure of the common rescue system is established on the territory of the whole country in compliance with the administrative division. The other parts of the common rescue system - the executive authorities, legal entities and traders, centres for emergency medical care, render assistance upon request from Ministry of internal affairs in accordance with the plans for conducting rescue and emergency repair and recovery works.

The protection from disasters is carried out on National, regional and municipal levels as the main obligations are separated for each level according to the respective competences.

The development and supporting of the external emergency plan and application of the protective measures is financed by the state budget.

With the changes of ASUNE in October 2010 the determination of the zones with special status has been amended. Around the NF, including the applied earth womb and air space above them, zones with special status are created – zone for preventive protective measures and surveillance zone, which are territories with special territorial protection.

The zone for preventive protective measures is created for limitation of the exposure of the population in case of accidents and it is forbidden to construct living and public buildings, kinder gardens, health facilities, places for catering and other sites, not related to the activity of the nuclear facility. The minister of health, minister of agriculture and food and the minister of environment and water can set limitations for usage of the lands, forests, and waters in the territory of the zone for preventive protective measures.

The surveillance zone is the territory outside of the boundary of the zone for preventive protective measures, in which the necessary control for the purposes of radiation protection is performed.

Emergency planning on nuclear facilities sites

The emergency plans for the main SF and RAW management facilities are in place:

- Emergency Plan of Kozloduy NPP Plc., 2009 revision; it includes the SF facilities on-site (spent fuel ponds and the SFSF) as well as the State Enterprise RAW facilities;
- Plan for remedying the consequences and protection of the public and environment in case of radiation accident during transport of spent nuclear fuel, 2006 revision;
- Emergency Plan of SE RAW-Kozloduy SD, 2008 revision;
- Emergency Plan of the nuclear research reactor at the INRNE - BAS, revision 3, January 2008;
- Emergency Plan of the SE RAW – Novi Han SD, 2011 revision.
- Internal emergency plan of SE Decommissioning – Kozloduy, revision 2011

The nuclear facilities of KNPP are classified category I, for which the initiating events for the site are postulated, such with very low probability of initiating, can lead to significant release in the environment and sever deterministic effects outside of the site.

The nuclear facility, operated by the SE RAW is classified in risk category III, for which the emergency events at the site can lead to exceeding of the dose limit for the staff in normal conditions and/or contamination with radioactive substances at the site and application of emergency protective measures.

The Emergency Plan of SE RAW-Kozloduy SD has been connected with the one for Kozloduy NPP. In case of emergency event the Chief Unit Shift Supervisor of KNPP Units 5&6 must be informed; he shall evaluate the event on the basis of the data received and, if the criteria are reached, activate the KNPP Emergency Plan. Both plans have been tested during drills and exercises.

The nuclear facilities operated by SE RAW – Novi Han SD, SE RAW-Kozloduy SD and INRNE-BAS are classified category III as regards emergency planning;

Emergency training and drills

The regulatory provisions require the licence holders and the holders of pursuant to the ASUNE to hold periodically emergency exercises and drills. Regarding sites and activities with threat category I, II and III at least once per year a general drill and emergency exercise shall be held. Except that a

separate training for the separate emergency teams are conducted. The performance of the trainings is done according to annual programme, which maintaining is a licensing condition for the operators of NF for management of SF and RAW.

The implementation of the off-site emergency plan is tested by emergency drills and full-scale emergency exercises, with the latter being conducted at least once in five years.

In May 2009 a full-scale national exercise for action in accident in KNPP was performed. The readiness for response and application of protective measures was checked, the coordination between the authorities and relationship with the media in informing of the population in case of accident with possible radiation consequences also. In the frames of the exercise practical drills and demonstrations of the implementation of protective measures in the zone for emergency planning around KNPP were conducted.

Bulgaria actively participates in international emergency exercises and drills for response actions in the event of a nuclear accident. In the period 2008 – 2011 the country has taken part in nine international emergency exercises and drills.

In 2010 the implementation of a "Regional programme for excellent achievements - Safe nuclear energy" began with the Norwegian programme for cooperation with Republic of Bulgaria for economical growth and stable development. In the frames of the programme NRA organised conducting of two courses for training on "Development, implementation and assessment of exercises for actions in nuclear or radiation accident" and " Actions in first reacting persons (rescue teams) in nuclear and radiation accident". Total number of 40 people from NRA, Ministry of Interior (civil protection and fire safety), Ministry of Health, Ministry of Environment and Waters and KNPP participated. In the frames of the same programme during 2011 a joint Bulgarian-Romanian exercise for actions, connected to accidents with spent nuclear fuel was performed.

Emergency preparedness regulatory inspections

The NRA exercises current control over the status of emergency planning and preparedness of the operators of nuclear facilities in consistence with the annual inspection plan for the control activities. A review consists of:

- Procedures and instructions for emergency evaluation and protection action implementation;
- Condition of the emergency and protection equipment for the emergency team members and centres for management of accidents;
- Implementation of the emergency exercises and drills - results, analyses, corrective measures

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."

Brief review of the information presented in the previous National Reports

The main requirements of the ASUNE and the regulations for its implementation in the area of nuclear facilities decommissioning are presented.

The existing licensing regime for decommissioning of nuclear facilities is presented and the two main regulatory documents- *Regulation on the Procedure for Issuing Licences and Permits for Safe*

Use of Nuclear Energy and *Regulation on Safety during Decommissioning of Nuclear Facilities*, that contain requirements in respect to decommissioning in the licensing process for the entire life cycle of NF.

The strategy for decommissioning of the shutdown units of KNPP and its new revision are presented. Detailed information for the preparatory activities for decommissioning is presented: radiological investigation of the NF for the purposes of the planning of decommissioning, final safety analyses report, Environmental Impact Assessment; implementation of engineering projects for processing of historical waste and with ensuring of the necessary methods and technical means for performance of activities for dismantling, decontamination and management of RAW. Information for the balance of the Decommissioning Fund and the sources for financing of the decommissioning preparatory activities is given.

Changes in the legislation frame, related to decommissioning of nuclear facilities

With the changes in ASUNE from 2010 the issuing of permission is revoked and a license for decommissioning is introduced, with which the duplicated permission regime is eliminated. The consistency of the licensees responsibility on safety is guaranteed for the whole decommissioning period. It is not obligatory that the operation and the decommissioning of one nuclear facility to be performed by the same legal entity. The license for decommissioning is issued for a period of 10 years.

Applying of the concept of release from regulatory control, a regulation mechanism is introduced for clearance of the materials. There is no separate licensing regime, but every individual clearance shall be approved with order by the BNRA. The introduced regime is in compliance with the accepted international practice and the requirements of Directive 96/29/EURATOM.

Human and financial resources

The availability of adequate human and financial resources for decommissioning is a legal requirement according to the ASUNE. The planning of the resources rely on the decommissioning cost estimate. On its basis NRA have to receive credible evidences that the financial resources are enough for implementation of the decommissioning plan.

Cost estimate is prepared by the licensee still in the earliest step (design of NF) as part of the preliminary planning for decommissioning. The updated plan for decommissioning is the basic document that should be submitted to NRA with the application for issuing the operating license. The periodical revision of the decommissioning cost estimate is a requirement towards the operator at every actualisation of the decommissioning plan.

For financing the decommissioning activities of the nuclear facilities a fund "Decommissioning of nuclear facilities" to the minister of economy, energy and tourism is established. The main incomes are payments by the entities that operate nuclear facilities. The size of the payments is determined so that at the end of the operational period the necessary means for covering the expenditures for decommissioning to be collected.

The mechanism of determination of the payments for collection of the necessary means and financing of the activities is specified in the "*Regulation on the order for establishment, collection, spending and control of the means and the size of the due payments in the fund "Decommissioning of nuclear facilities."*

In the decommissioning cost estimate the allowance of the personnel, including the training and exercises, are included.

According to ASUNE the safety related activities in nuclear facilities and with SIR, may be performed only by professionally qualified staff. The conditions and order for acquisition of professional qualification, the positions for which a qualification is required and for the performing of exams are determined in *"Regulation on conditions and order for acquisition of professional*

qualification and for the order of issuing of licenses for special training and for certificates for qualification for use of nuclear energy".

Information about the available qualified staff is presented under Article 22 in this Report

Radiation protection

According to art.20 of the *Regulation on safety during decommissioning of nuclear facilities,* the radiation protection during decommissioning of nuclear facility shall comply with the requirements, principles and norms in the RBSRP. For assuring radiation protection during the decommissioning the licensee develops in the frames of the decommissioning plan a concept and programme for radiation protection of the staff, population and environment.

During the dismantling of the nuclear facility, elimination of the physical barriers that limit the spread of the radioactive substances in the environment, is performed only if the liquid and gaseous discharges will not exceed the allowed limits for the whole period of the decommissioning works.

The RBSRP, the Regulation on safety of nuclear facilities and the Regulation on radiation protection during activities with SIR, that are applied during decommissioning of NF cover the requirements of art.24 of the Convention, related to the dose limits and constrains for the workers and the population, taking into account and the authorized radioactive releases.

Emergency planning

The requirements of ASUNE and the *Regulation on emergency planning and emergency preparedness in nuclear and radiation accident*, which are in connection with application in the national legislation of the requirements of Article 25 of the Convention are applied for each nuclear facility, including such in stage of decommissioning.

For issuing a license for decommissioning of nuclear facility the applicant is obliged according to the *Regulation on safety during decommissioning of nuclear facility* to submit to NRA internal emergency plan for preparedness and actions for protection of the staff, the population and the environment in case of radiation accident. The internal emergency plan is developed on the base of analyses of the possible emergency events and their consequences taking into account the actual status of the nuclear facility, its systems and components, important for the safety, the foreseen activities in the decommissioning plan for and the technical and organisational measures for assuring the safety. The internal emergency plan shall be developed according to the *Regulation on emergency planning and emergency preparedness in nuclear and radiation accident.*

Preserving the information, important for the decommissioning

According to art.33 of *Regulation on safety during decommissioning of nuclear facilities,* the licensee develops a quality management programme as a part of the decommissioning plan.

For the stages design and construction, commissioning, operation and the period of decommissioning, the respective permission holder or the licensee collects, distributes and keep the documentation and the information, related to the planning for decommissioning and with the performed activities for decommissioning. In the scope of information, important for the decommissioning, is the complete design documentation and the relevant design changes connected with the reconstructions and modernisations during operation, and the whole operational documentation, including records. All this documentation is transferred to and stored by the decommissioning licensee.

Detailed information about the status of the activities for preparation for decommissioning of the shutdown facilities in Kozloduy NPP till 30.06.2011 is given in Annex L-7.

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."

Brief review of the information, presented within the frame of the previous National Reports

It is noted, that the main safety requirements for spent fuel management were defined in the ASUNE and the regulations in force for its application.

The reports describe the requirements of the *Environmental Protection Act* regarding the assessment of the environmental impact (EIA) of the investment proposals connected with spent fuel management. During the drafting of the EIA the biological, chemical and other risks that may be connected with the SF management have been taken into account.

Consideration is given to the action envisaged by the Republic of Bulgaria to ensure reducing of the radiation impact on-site of Kozloduy NPP and avoid imposing of undue burden on the future generations.

A detailed examination is provided of the *Regulation on ensuring the safety of spent fuel management, Regulation on ensuring the safety of nuclear power plants, Regulation on ensuring the safety of research nuclear installations,* and the *Regulation of EIA of investment proposals for construction, activities and technologies* related to the implementation of article 4 of the Convention.

The reports indicate that the basic safety functions - ensuring of subcriticality and residual heat removal is assured by the design of the SF management facilities. To ensure subcriticality under normal operating conditions and in the event of design accidents, the effective neutron multiplication coefficient has to be below 0.95. The burn-up of SF may be used as a parameter justifying nuclear safety only if technical means are implemented to control the burn-up of the SF that is transferred to the facilities.

The design of the facilities for SF management envisages technical means and organizational measures that prevent the possibility of temperature rise of the spent fuel elements cladding above the design limits under normal operating conditions and in the event of design accidents.

Consideration is given to the regulatory requirements to the technological processes for SF management and preliminary treatment that have to be designed so that the RAW quantities should

be minimum practicable. The design shall ensure limitation of the volume and activity of the liquid RAW arising to a level as low as reasonably achievable. The RAW management systems are designed taking into account the requirements for SF safe management throughout the entire lifetime of the facility. It is highlighted that the RAW minimisation principle during SF management has also been adopted in the National Strategy for management of SF and waste.

It has been explained that according to the ASUNE and the regulations on its implementation, for the purpose of SF management the exposure for the personnel and the public has to be kept as low as reasonably achievable. Effective protection of the personnel, the public and the environment is ensured by applying the defence in depth principle through establishing a system of physical barriers along the way of ionising radiation spreading in the environment and a system of technical and organizational measures for protection of the barriers and preserving their effective performance.

The normative requirements are listed regarding the annual individual dose limit for internal and external exposure of the public caused by liquid and gaseous discharges to the environment from SF management facilities and also from discharges resulting from design and beyond design accidents.

Consideration is given to the legislative and regulatory measures for protection of the future generations and avoidance of the imposing of undue burden on them. The avoidance of the imposing of undue burden on future generations is stressed to be the key principle in the Strategy for SF and RAW management approved by the Council of Ministers. While considering the various options for SF management, the Strategy identifies as the best one in terms of avoidance of the imposing of undue burden on future generations, to be the option of transporting the SF back to Russia for processing and return of the RAW for storage.

The constructions and technologies used to ensure the subcriticality and residual heat removal in at-reactor SF ponds 1-6 and WSFSF has been described.

It is pointed out that according to the legislation requirements the design has to limit the liquid RAW volume and activity to as low as reasonably achievable levels through efficient cleaning systems and multiple use of the radioactive fluids, prevention of leakages from systems containing radioactive fluids, and reducing the frequency of occurrence of events that require significant decontamination efforts.

Information has been presented regarding regulatory requirements for:

- Taking into consideration the interdependence of the different SF management stages;
- Protection of the individuals, public, environment and future generations;
- Biological, chemical and other risks.

Legislation changes after presentation of the Third National Report

The *Strategy for SF and RAW Management until 2030* adopted by the Council of Ministers in January 2011 defines the main principles of the state policy for SF and RAW management.

Concerning minimization of the generated RAW

The basic principle established by the Strategy is that the generation of radioactive waste has to be kept to the lowest possible level in terms of activity and volume through appropriate design solutions and practices for the operation and decommissioning of the nuclear facilities. The waste generation should be minimized through:

- Separation and sorting of the various types of waste and materials for purposes of optimizing the management thereof;
- Application of state-of-the-art technologies, practices, and operation procedures ensuring minimization of radioactive waste, including the secondary RAW;
- Minimization, as far as possible, of RAW generation during design of the nuclear facilities, during the operation and decommissioning thereof.

Concerning protection of the individuals, the public, and the environment

In the *Strategy* is pointed out that the management of the spent nuclear fuel and radioactive waste should ensure an acceptable level of human health protection from exposure with ionising radiation through application of the concept for justification, optimisation, and restriction of the dosage. Fulfilment of this principle ensures radiation protection in the SF and RAW management facilities through implementation of measures for:

- Not exceeding of the dose limits;
- Excluding unjustified irradiation by controlling the potential exposure pathways;
- Reducing and maintaining the radiation doses to the minimal possible level.

The SF and RAW Management should take place in such a manner in order to ensure an acceptable level of preservation of the environment by minimizing the discharge into the environment of radionuclides at various stages of their management.

Concerning avoiding actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation

According to the *Strategy* the SF and RAW waste must take place in such a manner as not to place an excessive burden on the future generations, i.e., without exceeding the levels of consequences deemed acceptable in our time. Implementation of this principle is based on one of the approaches for applying the sustainable development concept, with the present generation encouraged to do its best as to durably ensure the security and safety of the operations and SF and RAW facilities, without excluding the choice of options for the future generations. In this context the present generation's responsibilities lies in the following commitments:

- Elaborate and/or adopt technologies for reprocessing, storage, and disposal of radioactive waste restricting as much as possible the impact for the future generations, including through application of a multi-barrier approach, where both physical and engineering barriers play a key part;
- Preserve the knowledge and information about the activities associated with the SF and RAW management for the purposes of presumed economic consequences and the potential need for monitoring and technical servicing.

Technical information concerning ensuring subcriticality and residual heat removal in different SF management facilities is provided in Annex-1.

Information about generated RAW during SF management in the WSFSF and about respective trends also, is provided in the Section H of this Report under the Article 11 of the Convention. The same section a summary about the generated RAW in Kozloduy NPP units 1-6 and respective trends is provided.

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."

Brief review of the information presented within the frame of the previous National Reports

A description of the SF management facilities available by the time of entering in force of the Convention has been presented. Data is provided on the performed and the planned safety analyses of the WSFSF and the at-reactor ponds in Kozloduy NPP. The transitional provision of the *Regulation for providing the safety of spent nuclear fuel management* are presented regarding

modifications resulting in changes in structures, systems and components important to safety and located on the SF management facilities, that had been commissioned before the Regulation coming in force. It is stated that the provisions of the regulation apply in maximum force to the established SF management facilities.

Information is presented on the safety reviews and safety enhancements of the existing facilities.

Detailed information is provided about the following reviews and enhancements performed in the WSFSF: "accelerated corrosion tests", evaluation on the status of the construction materials of the ponds lining and the transport storage baskets, and analysis to determine the lifetime of the SFSF building and equipment.

The results of from the safety review of reactor ponds 5&6, which was conducted within the framework of SAR updating after the modernisation of the respective units, have been presented.

Safety reviews and safety enhancements carried out on the existing facilities

In connection with the preparation for loading of CONSTOR 440/84 dry storage casks and with the respective changes in the operating license of the WSFSF, an *"Analysis and assessment of the operations in the WSFSF, related to the DSFSF project"* has been performed.

The aims of the performed analysis were:

- To determine the potential initiating events, which may happen in the WSFSF during transportation and manipulation of empty and loaded CONSTOR 440/84 casks;
- To review and compare the existing list of initiating events in WSFSF with list of potential initiating events, that may happen as a result from the future operations after the DSFSF commissioning. To amend the list of initiating events in WSFSF if during the review a new initiating events have been identified;
- To assess the influence of the future changes resulting from DSFSF construction on the WSFSF safety considering the amended list of initiating events;
- To recommend additional measures to improve the WSFSF safety, if necessary.

The scenarios of cask dropping, loss of power, fire, and external events (earthquake, missiles) have been considered in details. The main results from the analysis are:

- New initiating events have not been identified;
- There is no need to change the WSFSF SAR;
- Recommendations have been made concerning some organizational measures to improve safety and to update the *Technical Specification for Operation* of the WSFSF.

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."

Brief review of the information presented within the frame of the previous National Reports

The reports describe the requirements set out in the *Regulation for providing the safety of spent nuclear fuel management* and the *Regulation on the procedure for issuance of licences and permits for the safe use of nuclear energy* regarding the site selection for SF management facilities. It is highlighted that in the process of the site selection for SF management facilities it is necessary to study and assess the site features that may affect the safety of the facilities, and the effect of the SF management facilities on the public (present and future) and the environment. A list of documents is provided that the applicant has to submit together with the application for issuance of a site approval order. The data is identified that needs to be included in the preliminary safety analysis report that should be part of the document package of the application for issuance of a site approval order. It is also stated that whenever the nuclear facility is envisaged to be located on-site of another already constructed and commissioned nuclear facility, the preliminary safety analysis report shall consider the possible impact on the safety of the proposed new facility and the other nuclear facilities built on the same site.

The reports describe the requirements of the *EPA* for organizing of a public hearing of the EIA results together with the municipality authorities and the competent body that issues the decision on the EIA. The sequence of EIA implementation is provided, as regulated in the *Regulation about the environmental impact assessment of investment proposals for construction, activities and technologies*. The competent body for making a decision on the EIA is the Minister of the Environment and Waters. The decision on the EIA is made on the ground of the prepared environmental impact assessment, the results from the conducted consultations and public hearing in compliance with the legislation in force. If necessary, the decision should contain measures for mitigation or averting of negative impacts on the environment drafted as a Plan and being obligatory for implementation by the investor/operator during the designing, construction, operation and eventual shutdown of the installation/facility.

A list is provided of the responsibilities of the Minister of Environment and Water in connection with notifying other states about investment proposals for construction, activities and technologies on the territory of the Republic of Bulgaria regarding which a considerable environmental impact on their territory can be assumed.

The reports also note that the Republic of Bulgaria is a party to the Convention for Evaluation of the Environmental Impact Assessment in transboundary context. There is a list of the agreements for operational notifying in case of nuclear accident and information exchange on nuclear facilities with the neighbouring countries.

Information has been provided about:

- The issued site selection permit and an order for site approval of the DSFSF site selected;
- The issued order for site approval of the Belene NPP site.

Issued permits for site selection for SF management facilities

During the period after presentation of the Third National Report permits for site selection and orders for site approval have not been issued.

Legislation changes after presentation of the Third National Report

The *Strategy for SF and RAW Management until 2030* adopted by the Council of Ministers in January 2011 states that public acceptability of the activities associated with the SF and RAW management constitutes a democratic principle of governance requiring compliance with the

conditions of transparency, awareness, and involvement of the public in the decision making concerning the RAW and SF. The *Strategy* prescribes measures for:

- Enhancing interaction via direct communications with representatives of the civil society, who are opinion leaders;
- Holding public discussions on the EIA reports. They are a positive mechanism proven over time for achieving acceptability of the public;
- Providing the information to the citizens about the environmental condition during conduct of activities associated with the SF and RAW management and creating a positive image of and trust in those activities.

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."

Brief review of the information submitted in the frame of the previous National Reports

A description of the requirements of the *Regulation for providing safety of spent nuclear fuel management* and *Regulation for safety of the decommissioning of nuclear facilities* concerning design and construction of the SF management facilities is provided. It is pointed out that safety of the spent fuel management facility is provided through:

– Conservative approach in establishing the barriers and the protection levels;

– High quality of design, construction and equipment;

– Implementation of technologies proved in the practice;

It is pointed out that the design of the spent fuel management facilities should contain a preliminary SAR for spent fuel storage, transport and handling for normal operation and design-basis and beyond design-basis accidents. After the facility construction, the SAR is updated according to its current state.

The obligation of the Holder of the permission for design or construction to develop preliminary and interim concepts and plans for decommissioning of the nuclear facility has been discussed. The requirements to the content of the Concept including the requirement for completion of the preliminary analysis and assessment of the impact of the decommissioning of the nuclear facility on the population and the environment were given.

Detailed technical information about DSFSF construction on Kozloduy NPP site is provided. The main conditions of the issued by the NRA Chairman order for design approval and construction permit have been presented.

The conditions of the issued design permits for Belene NPP units 1 and 2 have been presented.

Designed and constructed facilities

DSFSF at the site of Kozloduy NPP

During the period after presentation of the Third National Report the construction of the DSFSF continued.

On 03.12.2009 the NRA Chairman issued an order for amendment of the construction permit of the DSFSF allowing the construction of the Stage 1a, which increases the capacity up to 5256 SF assemblies from WWER-440 reactors.

In March 2011 the DSFSF construction were finished and state commission according to the national legislation for construction activities has accepted the facility. The facility has received a permit to operate by the National Construction Control Board of the Ministry of Regional Development and Public Works.

On 29.07.2011 an application for issuance of commissioning permit were submitted to the NRA. At present time the application and the attached documents are being reviewed and assessed according to the requirements of the *ASUNE* and regulations issued on its implementation.

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).

Brief review of the information presented in the frame of the previous National Reports

Description of the requirements of the *Regulation for providing the safety of spent nuclear fuel management* and *Regulation for safety of the decommissioning of nuclear facilities* concerning design and construction of SF management facilities is provided. It is pointed out that the performance of the safety assessment is main responsibility of the licensees and the design of the spent fuel management facilities should contain the preliminary safety assessment reports. Information is presented concerning the environmental impact assessment.

It is pointed out that the design of the spent fuel management facilities should contain a preliminary SAR, which is updated in compliance with the current status of the facility after its construction. The SAR shall contain technical and organizational measures, safety analysis and assessment, justification of the performance of main safety functions, the identification of risk of initiating events considered in the design, the demonstration of the achieving of the objectives and safety criteria. The Safety Assessment Report reflects the physical condition of the facilities throughout their entire operational lifetime and in the period of decommissioning.

Most important requirements to the content of the preliminary SAR, which is submitted with the request for issuing the permission for approval of the selected site for the nuclear facility, are reviewed. It is pointed out that it is obligatory to attach the decision on the Environmental Impact Assessment Report (according to Chapter 6 of the *Environmental Protection Act*) to the request for approval of the selected site for nuclear facility.

It is pointed out that to the request for issuing the approval of the developed technical design of the nuclear facility, the Applicant shall also attach an Interim SAR elaborated on the basis of the preliminary SAR and the technical design of the facility. The Final SAR elaborated on the basis of the interim report containing the results from the commissioning of the nuclear facility shall be attached to the application for issuing a license for the operation of nuclear facility.

The main stages of the review and assessment of the FSAR according to the national legislation and internal NRA rules have pointed out. The main results from the ISAR review and assessment performed within the frame of the design approval procedure have been presented.

Review and assessment of the safety reports.

АЕЦ Белене

According to the requirements of the *Regulation on the procedure for issuance of licences and permits for the safe use of nuclear energy*, the applicant should present in the NRA a Technical Design, including ISAR and PSA report, in order to obtain design approval.

Over the period following the submission of the Third National Report the review and assessment of the presented by the applicant Technical Design of Belene NPP and attached Intermediate Safety Analysis Report (ISAR) and Probabilistic Safety Analysis (PSA) report has begun. The NRA experts took part in the assessment of the design as well as external Bulgarian and international expert organizations. In 2010, the NRA received a new version of the Technical Design, taking into account the comments and recommendations given by the regulatory authority on the previous version. The final reports from the expert review were submitted to the applicant.

For the approval of the design it is necessary that the applicant should make the necessary amendments in the design documentation in accordance with the results of the follow-up expert review and which the NRA should accept. Meanwhile, the NRA is continuing its activities on the review and assessment of the design, all the submitted by the applicant replies to the individual comments and recommendations being discussed in detail.

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.

Brief review of the information presented within the frame of the previous National Reports

The reports present information on the requirements of the ASUNE regarding issuance of an operational licence for nuclear facilities. They describe the requirements set out in the *Regulation for providing the safety of spent nuclear fuel management, Regulation on the procedure for issuance of licences and permits for the safe use of nuclear energy* and the *Regulation for safety of the decommissioning of nuclear facilities* regarding the commissioning and operation of the SF management facilities.

The requirements to the Programme for commissioning of a nuclear facility are identified. This Programme is attached to the application for issuance of a commissioning permit for a NF. The reports note that an operational licence is issued to a nuclear facility only after the conditions of the

nuclear facility permit for commissioning have been fulfilled, which has to be confirmed by a committee of inspectors from the NRA, appointed with an order of the Chairman of the NRA. This committee shall review the document submissions and conduct an on-site inspection. There is a list of the key documents required to be submitted together with the application for issuance of an operational licence for a nuclear facility.

It is stressed that the Technical Specification for Operation that contains the operating limits and conditions shall be compiled on the design of the facilities and the preliminary SAR, and is later adjusted and corrected following the commissioning stage, the introducing of design changes and updating of the SAR.

The operators responsibilities are reviewed as regards developing and applying of parameters and evaluation methodology of the safety level during operation, including a programme for safety self-evaluation that contains an assessment of the safety level achieved, comparison with the planned safety level and specific steps to improve safety.

It is stated that the operator must develop and apply a system for storing, processing and analysis of the information related to the operation of the facilities, the status and failures of the systems and components and the errors made by the personnel. The results from the analyses are reported on a systematic basis and are applied to improve the operating practice, personnel qualification and to optimise the maintenance process.

Information is presented concerning updated licenses of the Kolzoduy NPP units 1-4 with regard their shutdown and forthcoming decommissioning.

The system of Kozloduy NPP procedures for evaluation and analysis, and methods used to take decisions for corrective measures and assessment of their effectiveness as regards the feedback of operational experience has been presented. The reported events happened in the SF management facilities on site and corrective measures performed have been presented.

Operation of the SF management facilities

WSFSF

During the period after presentation of the Third National Report new operating licenses for SF management facilities have not been issued.

In connection with the preparation for loading of CONSTOR-440/84 dry storage casks in WSFSF in September 2010 the operating license of the SFSF has been amended. The main issues in the order for the amendment of the license are:

- In the list of permitted activities a “manipulation of CONSTOR-440/84 casks” has been added;
- The licensee is obliged to perform a review of the operating documentation and make the respective changes before starting loading operations with the first cask;
- The licensee is obliged to update the SAR according to the results of the performed *“Analysis and assessment of the operations in the WSFSF, related to the DSFSF project”*. (Information about this analysis is presented in this Section under the Article 5. of the Convention);

At-reactor SF ponds 1 and 2

In connection with the decision of the Council of Ministers to declare the Kozloduy NPP units 1 and 2 as RAW management facilities, their operating licenses have been suspended and new licenses for operation of RAW management facilities have been issued.

Reporting of events, analysis of the operational experience

Kozloduy NPP, units 1-6 and the SFSF

In the period since the issuance of the Third National Report, one operational event has been reported in relation to the SF management, and it was rated as "deviation" according to the INES scale.

On 24.10.2010 during fuel handling at unit 6 it have been discovered a difficulty for placement of one fuel assembly in its slot. The inspection with a TV camera found out that the neighbouring assembly is deviated from its vertical position and its tail-end is in the slot different from the described in the refuelling programme. The implementation of the refuelling programme was terminated. The additional inspections showed that there are no mechanical defects on the assemblies and their slots. The implementation of the programme was resumed in 06:30 on 26th of October. There are no changes in the radiation environment around the reactor or in the primary circuit coolant.

According to the INES scale, the event was rated as “deviation” from the normal operation.

The following causes of the event were found:

- The protective device of the TV camera of the refuelling machine caused shifting of the fuel assembly from its prescribed position;
- The existing written instructions does not contain operational limits for the TV camera during refuelling machine operation;
- The construction and size of the TV camera’s protective device allow a physical contact with fuel assemblies if the camera is moved lower than certain position;

The following corrective measures were implemented

- The fuel assembly has been moved on its place according to the refuelling programme;
- The respective operating instructions are updated with introducing operational limits about the TV camera position during refuelling machine operation;
- A technological interlock is made to prevent moving the camera under certain position;
- The construction of the protective device of the TV camera is changed in order prevent physical contact with fuel assemblies.

Decommissioning plans

Preparation of decommissioning plans for the SF management facilities is discussed in Section F of the report, under Article 26 of the Convention.

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.”

According to the ASUNE, the Council of Ministers may declare the spent fuel to be radioactive waste under conditions specified in the Act.

In the *Strategy for SF and RAW Management until 2030* adopted in January 2011 the SF disposal option is also considered. It is stated that in the long-term plan, accounting for the global and general European consensus for deep geological repository, it is presumed that this is the most suitable option for durably guaranteed safety in the isolation of highly active and long-life radioactive waste. Accounting for the country’s geological and climatic conditions, the legislation, the public stances, the financial abilities, and the volume of high-level waste, including high active SIR, the country’s involvement in projects for regional and international initiatives is deemed expedient. It is pointed out that the search for international solutions must not jeopardize the current national program**.**

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."

Brief review of the information presented within the frame of the previous National Reports

In the previous National Reports the basic regulatory acts namely the ASUNE, HPA and EPA are presented, and also the regulation on their application for ensuring protection of the people, society and environment from radiological and other risks. The main changes in them are commented that regulate the requirements in article 11 of the Convention.

Control for compliance with the legal requirements in the field of nuclear safety and radiation protection is performed by the competent authorities - NRA, Ministry of Health (State health control of the fulfilment of the requirements for protection of the persons from the impact of ionising radiation, performed by regional inspections for control of public health) and Ministry of Environment and Water in the frames of the licensing process.

Ensuring of subcriticality and decay heat removal

Art. 42 of the *Regulation on safety in RAW management*, requires, when needed, the project for facility for storage of RAW to contain technical decisions for keeping of subcriticality and the decay heat removal for the whole term of operation of the facility. Requirements for subcriticality and the decay heat removal are determined also for the project for facility for disposal of RAW according to art.62 of the above regulation.

As for the existing and also for the offered so far in Republic of Bulgaria facilities and activities for treatment of RAW, they don't require special measures for subcriticality and the decay heat removal. This is justified in the relevant safety reports and is assessed during the licensing process. It is also controlled by the licensing regime at implementation of important for safety modifications in the design of the NF. In cases, when RAW are fissile material the legislation for the spent fuel is applied.

Minimisation of the RAW

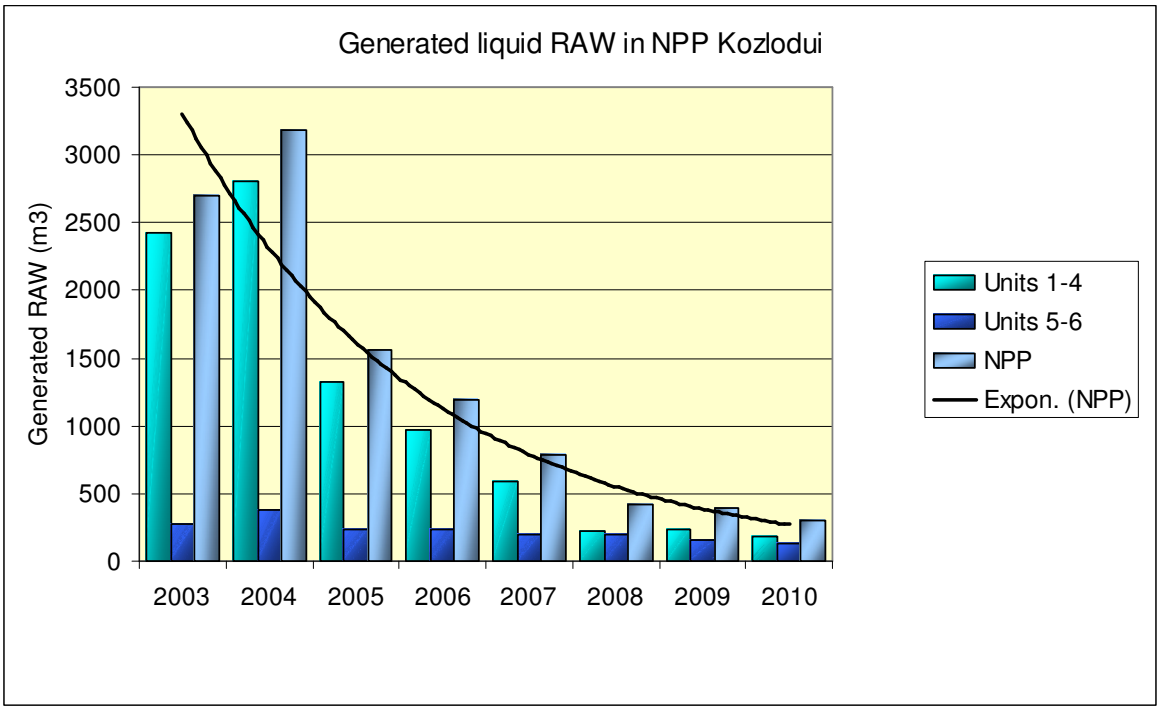
The requirements for minimising of the generated RAW from the allowed practices is included in ASUNE and is given in details in *Regulation on safety in RAW management* . With priority before the measures for reducing the volume and activity of the RAW in their following management is the limitation of the generation of RAW to the source of their formation by:

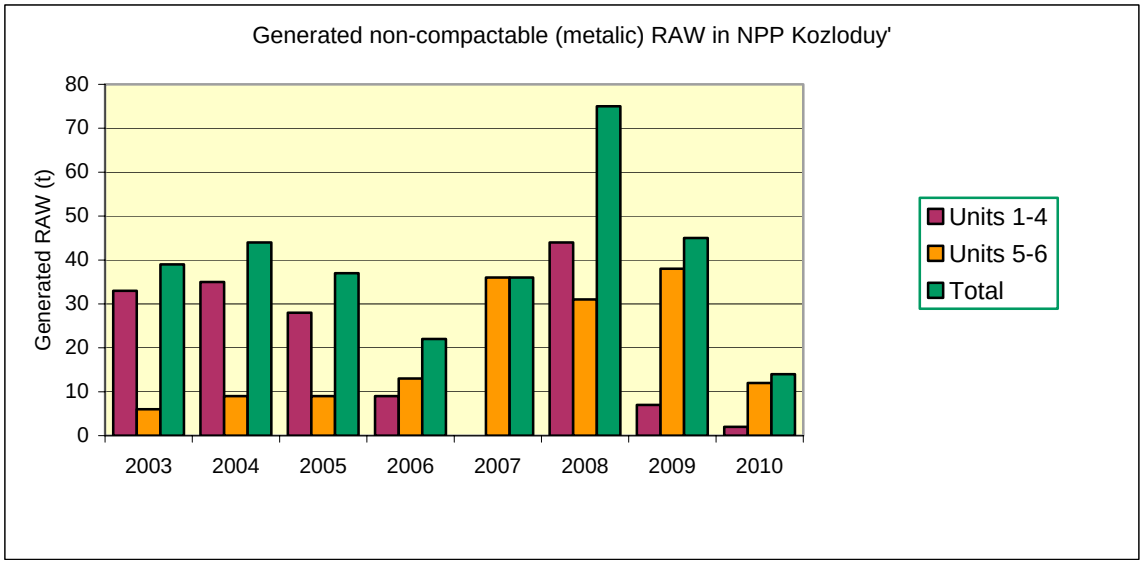
- separation and sorting of RAW depending of their characteristics and the foreseen methods for their next management, so that the mixing and/or intended dilution of radioactive and non radioactive media and/or waste is not allowed;
- prevention of dispersion of contamination in the facilities
- usage of technologies, in which a minimum volume of RAW is generated
- performing of decontamination only after "cost/benefit" analyses
- storage of RAW intended for next release from control or disposal

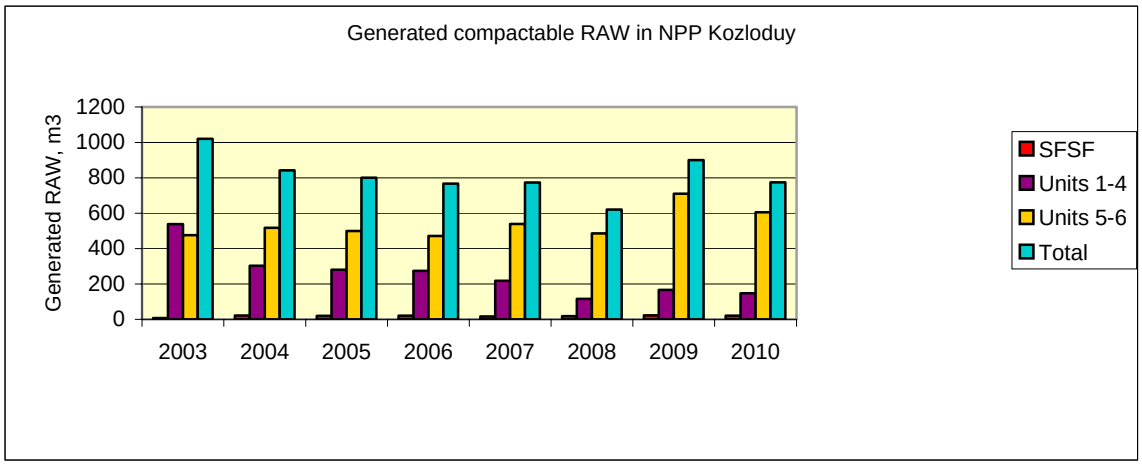
Except the use of methods that don't lead to non justified increase of the volume of conditioned RAW, application of the concept for release of materials from regulatory control is decisive factor for the minimisation of the final volume RAW for disposal.

The requirements for minimisation of the RAW have to be taken into account at the stage of design, construction, operation and decommissioning of the nuclear facility.

Indicators for the application of the requirements for minimisation of RAW are the data for the period 2003-2010, given in the charts below. They show stable acceptable level of amount of RAW, generated during operation of KNPP.







With the completion of the projects for modernisation of units 5 and 6 after 2008 the amount the generated non compactable (metal) solid RAW category 2a in PP-2 is decreased.

Since the closure of units 1÷4 the liquid RAW generation has decreased drastically. During operation of units 5 and 6 a systematic policy for decreasing of the generated liquid RAW is conducted. As a whole the tendency of decreasing of liquid RAW, generated in KNPP is kept.

As a result of the applied measures for minimisation of the currently generated RAW, the capacity of the existing facilities for treatment of RAW is now sufficient for their treatment in time, together with the historical waste. In the period 2008-2010 a stable status has been reached - the quantity of the treated RAW to overwhelm significantly the quantities of the generated in KNPP RAW, which determines the tendency for decreasing of the amount of the RAW, stored non- treated on the site of KNPP.

Together with the limitation of the generated RAW a necessary attention is paid to the requirements for the minimisation of the amount of RAW for disposal by application of suitable methods for treatment and conditioning and application of the concept for release from regulatory control. In SE RAW-Kozloduy practices for minimising of the volume of the RAW for disposal, are applied by reduction of the volume of the compactable RAW. A procedure for release from regulatory control (non conditionally or conditionally for recycling) of the decontaminated metal RAW is applied.

In the SE RAW – Novi Han SD control equipment is introduced for identification and sorting of the waste by their radionuclide content. A system for cleaning of low level secondary liquid RAW is put in operation, that leads to decreasing of the volume of the stored at the site RAW.

Accounting for the interdependencies among the different steps of the RAW management

Taking into account the interrelations among the stages of the RAW management is one of the main responsibilities of the operators of nuclear facilities, as defined in the *Regulation on safety in RAW management*. It is required the activities for the RAW management to be performed so that to facilitate the future stages of management of the RAW. The applied methods for treatment have to guarantee consistency with the acceptance criteria in the storage and disposal.

The Regulation imposed the obligation before the entities generating radwaste to prepare and submit programmes management of all generated, including:

- available and foreseen sources, flows, amounts and characteristics of RAW;
- the chosen variant for management of every flow of RAW, including terms and activities for treatment, storage and disposal or release from regulatory control;
- demonstration of compliance with the national strategy for management of RAW and with the main requirements for the management of RAW, taken from ASUNE (and the regulations for its applications);
- description of the method used for ensuring of safety in RAW management;
- administrative organisation and infrastructure for implementation of the programme;
- necessary financial resources and sources of financing and evaluation of the risk.

By its character and purpose the programme represents a practical approach for application of the principles for optimisation and justification of the activities for management of RAW.

In case when the management is performed by more than one entity, the programme is approved between the different operators.

Such programme is held by KNPP since 2005 together with SE RAW and is presented to NRA for review when changes are made.

The requirements of the physical transfer of RAW between operators of different nuclear facilities are determined in *Regulation on the terms and conditions for transfer of RAW to the RAW State Enterprise,* part of the created mechanism for accounting of relations between the separate stages of the management of RAW.

Each waste generator shall develop a programme with technical specification of the generated RAW, schedule for delivery to the state enterprise, description of the measures for ensuring of effective RAW management and control from the point of their generation to the transfer point, etc. The RAW SE on its part shall conduct a verification on the RAW compatibility and qualification for acceptance, in order to confirm that at all stages of the RAW management, appropriate technical and administrative measures are applied to ensure correspondence with the acceptance criteria.

In Bulgaria does not currently exist a RAW disposal facility. In the process of selection of a site and technology for disposal of this waste, the characteristics will be taken into account of the packages obtained using the existing technology and conditioning methods for which the NRA has approved the technical specifications, recipes and procedures.

Protection of the individuals, public, environment and future generations

Detailed information on the implementation in the national legislation of the accepted principles for limitation of the dose exposure, justification of the practices with an aim of protecting of the personnel and the public is provided in Section F of this Report (article 24 of the Convention).

The accepted in the Bulgarian legislation limitations for the doses for the future generations, that could be produced by the disposal of RAW, are not more liberal than the current dose limitations for the public. The concrete values and the applied approaches for limitation of the doses are discussed in chapter F of the report.

Avoiding burden to the future generations

The Bulgarian legislation is based on the principle of avoiding undue future obligations for the future generation. In the *Regulation on safety of RAW management* this principle is developed in direction of the timely processing of RAW until it has been conditioned into a safe long-term form, as well as a timely disposal of the processed waste. The regulation also contains requirements for post-closure control and monitoring of the facilities in compliance with the results from the assessment. The confirmed in the newly accepted in 2011 *Strategy for SF and RAW management* plans for the construction of a national repository for disposal of low and intermediate level RAW and selection of a disposal option for high level and long-lived RAW are application of the principle for protection and not imposing undue burden on future generations.

Development is undergone in the recent years for the views for the process of decommissioning of NF. In the actualised strategy for decommissioning of units 1-4 of KNPP a concept for immediate dismantling is accepted. The ensuring of the necessary financial means for management of RAW, including these from the decommissioning, is not left to the future generations. The collection, expenditure and effective system of control of the necessary resources is determined in the "*Regulation on the order for establishment of collection, expenditure and control of the means and size of the due payments in Fund "Radioactive wastes" and the "Regulation on the order for establishment collection, expenditure and control of the means and size of the due payments in Fund "decommissioning".*

Biological, chemical and other risks

Biological, chemical or any other conventional risk are subject of the national legislation in the field of health and protection of the environment. By its nature the management of RAW from KNPP is not related to a bigger risk of another nature than the radiation one. In spite of that NRA follows in the process of the licensing process that the applicable legislation in these fields to be observed. The assessment of this type of risks is subject to EIA that is required according to the *Regulation on the order of issuing licenses and permissions for safe use of nuclear energy* for the main stages of the life cycle of the every nuclear facility.

In the cases of the institutional RAW, generated in medicine and scientific research, the conventional risks are taken into account in developing specific procedures for management of RAW, following the requirements of the applicable legislation.

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."

Brief review of the information presented within the frame of the previous National Reports

The existing facilities to the date of the entering in power of the Convention are presented.

It is mentioned that the safety assessment of the operating facilities has been regulated by the national legislation as a basic requirement for extension of the operational licence, the validity of which may not exceed 10 years.

It is mentioned that the results from the safety assessment of the RAW management facilities, operated by KNPP, SE RAW-Kozloduy, SE RAW-Novi Han demonstrate the protection of the personnel and the public under normal and emergency conditions.

Detailed information about RAW from past practices is presented – the waste from the shutdown uranium mining and processing industries and the storage of the spent sealed sources from other nuclear applications.

Existing facilities

The process of review of the final safety assessment (SAR) is structured in the frames of the regulatory body and can include external expertises.

Facilities of KNPP

Kozloduy NPP has facilities for treatment and storage of RAW, constructed according to the plant design. The operation of these facilities is considered as part of the operation of the plant and is subject of the uniform licensing regime. Safety review of the facilities for treatment and storage of RAW is performed in the frames of the periodic safety reviews of KNPP.

According to the conditions of the Licenses for operation of units 5 and 6 during 2010 the SAR is actualised in compliance with the changes performed in structures and components, important for safety, the new analyses of transitional and accident regimes and the requirements, related to the described.

In the beginning of 2011 in relation with the conducted preparation activities for decommissioning the final SAR for units 3 and 4 was developed, version 0A. A preliminary review and assessment of the document are performed by KNPP and a new version of the document is under preparation.

Final SAR for the upcoming stage of decommissioning of units 1 and 2 is in advanced stage of development, a review of version 2 of the document is performed.

After the declaration of units 1 and 2 as facilities for management of RAW, the determined operator SE RAW manages the project for the development of the final SAR for decommissioning of units 1 and 2.

SE RAW facilities.

The periodic safety reviews are performed for the nuclear facilities for management of RAW, operated by SE RAW-Kozloduy SD, SE RAW-Novi han SD and for units 1 and 2 of KNPP as facilities for management of RAW, operated by SE Decommissioning-Kozloduy.

A safety assessment for separate sites in these nuclear facilities is performed, including Assessment of safety of the storage for low level active contaminated soils in SE RAW-Kozloduy SD and the hot cell in SE RAW-Novi Han SD.

In all assessments the generally accepted analytical approaches are applied, including analyses of the possible events (internal and external) on the basis of detailed analysis and probable events and the possible scenarios are generated in the assessments.

The results from the analyses show that the protection of the staff and the population in normal and accident conditions is guaranteed, and the contribution of the facilities in the exposure of the population is negligibly small.

The actualised reports from safety analyses are submitted to NRA for review in the frames of the process of renewal and issuing of the relevant licenses for operation. The licenses for operation of units 1 and 2 as facilities for management of RAW are issued in October 2010, the license for

operation of SE RAW –Novi Han is renewed in June 2011 for a period of 8 years. As a result of the performed regulatory review the transitional conditions are formulated in the licenses for operation, setting obligatory for fulfilment organisational and technical measures with relevant terms. Thus the continuous process of improvement of the safety is guaranteed.

Past practice

In order to fulfil the provisions of the *Regulation on the terms and conditions for transfer of RAW to the RAW State Enterprise,* measures for acceptance of RAW from past practices, mainly orphan spent sealed sources and from bankrupt enterprises are performed.

Additional information is provided in Section J of this report.

RAW from the shutdown uranium mining

Remedying the consequences from the extracting and processing of uranium raw material on the territory of the Republic of Bulgaria is realized pursuant to the Council of Ministers Decree Nr 74 of 27.03.1998., changed and amended in 2007 with measures for restricting of the environmental impact for wider number of sites. According to the Decree the activities for technical liquidation, technical and biological recultivation, management and cleaning of the waters, implementation of monitoring nets in these regions are organised and controlled by Eco-engineering RM Ltd in Ministry of economy, energy and tourism. The measures from the Decree for removal of the consequences from the extraction and processing of uranium ore are fulfilled in great extent. The problems with the recultivation of the tailings in Buhovo and in Jana are still not solved. Cleaning of contaminated waters is performed at three sites. Taking into account the prepared risk assessments and the decision of the Ministry a construction of new cleaning facilities is not foreseen for other sites. The Ministry of environment and water performs an independent state radiological monitoring of the environment in the regions of the former uranium mines.

More detailed information for the past practices is given in Annex L-3 and L-4 of this report

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."

Brief review of the information presented within the frame of the previous National Reports

In the previous reports the requirements of the ASUNE regarding the way of permit issuance for site selection for new facilities, and the provisions of the EPA for carrying out an EIA of such facilities is presented. The reports contain information on the legal requirements for arrangements of public hearings and of consultations with potentially interested neighbouring countries. The key role has been highlighted of the quality implementation of the preliminary safety analysis during the approval of the site selected for construction of the repository. Special attention has been paid on the requirements to sites for RAW disposal facilities as regulated in the *Regulation on providing the*

safety during RAW management. The four main phases of site selection have been pointed out, as defined in the same regulation, and the document submissions required by the regulator. Information about the process of site selection of Belene NPP is presented.

Evaluation of the site selected for the RAW management facility

The permission regime for site selection for a RAW management facility is the same as for any other nuclear facility as discussed in article 6. For approval of the site from NRA submissions of the preliminary safety analysis report, taking into account all factors, related to the safety of the site, which can have influence on the safety of such facility during its term of operation, and also for the facility for disposal after closure is necessary.

According to *Regulation on providing the safety during RAW management* site selection for facility for treatment and storage of RAW is performed on the basis of assessment of:

- the influence of the factors with artificial and natural origin on the safety of the facility
- the impact of the facility on the environment
- radiation influence of the facility on the site
- the specific characteristics of the site important for the migration and the accumulation of the radioactive substances
- the possibility for application of measures for protection of the population in case of accident in the facility

At the selection for facility for disposal, assessment of the safety, related to the evaluation of the ability of the site to guarantee the integrity of the barriers for maximum long period of time and demonstration of the ability of the site in combination with the chosen concept for disposal, to ensure the protection of the population observing the dose limits and constrains for the population are performed.

The offered facility for disposal of RAW- the National repository for RAW is in a stage of site selection.

The repository is foreseen to be near-surface multi-barrier engineered facility for storage of generated in the country conditioned short lived low and intermediate RAW (category 2 according to the categorisation in the *Regulation on safety in management of RAW)* from nuclear facilities and nuclear applications.

The issued by the regulator permit for selection contains conditions, that are obligatory for fulfilment by the licensee – SE-RAW during the stage. At present, the NRA has approved a Report for conception for disposal of RAW, Report on data collection and analysis of the areas, Report for characterisation of the sites of the NRRAW. At phase characterisation of the sites a detailed investigations of the three potential sites is conducted. By applying an analysis based on a system of 23 comparison factors (criteria), the potential sites have been assessed and classified and the preferred site is determined. The plan and the Programme for Quality Assurance for realisation of this last (forth) phase "Confirmation of the site for NRRAW" are approved by NRA.

The documents for that are necessary to be submitted together with the application for issuing of an order for approval of the selected site according to art.37 of the Regulation on the order for issuing of licenses and permissions for safe use of nuclear energy are developing. Obligatory condition for issuing by the NRA Chairmen of order for approval of the site, is the approval by the Expert Council of Ministry of Environment and Water of positive decision for the Environmental Impact Assessment.

Access to information related to safety and consulting of the neighbouring countries for such facility

The access to information on the safety of proposed RAW management facilities is mainly ensured by the implementation of the EIA provisions regarding the carrying out of the mandatory procedure on EIA for such a facility.

The Report for EIA of the investment proposal for construction of NRRAW, on the base of approved by MEW range and content of EPA, is developed.

This EIA was subject to public hearings in the villages in the regions.

In compliance with the requirements of the Convention for EIA in trans-boundary context, the Republic of Romania was notified with information on art. 3 of the same Convention, the Statement for determination the range and content of the EIA, the Report for EIA of the investment proposal for construction of NRRAW and the appendixes to it are submitted and public hearings are performed.

Additional information related to the site selection for NRRAW is presented in chapter K.

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."

Brief review of the information presented within the frame of the previous National Reports

Current requirements regarding the designing and construction of nuclear facilities are introduced in the legislation after the First review of the fulfilment of the obligations of Republic of Bulgaria of Convention, when substantial shortcomings were made obvious. In the Second National Report the main statements in this field according to the new *Regulation on the safety during RAW management were presented*, in which the ensurance of the radiation protection is determined as a main requirement in the design of a RAW management facility.

The regulation contains detailed requirements to the designs including the application of the defence-in-depth concept, definition of design limits, operational modes, classification of systems, structures and components and procedures for this classification, also specific requirements to the design of different types of facilities for RAW management- for treatment, storage, or disposal.

The requirements for planning and implementation of decommissioning measures for the RAW treatment and processing facilities are determined.

The requirement to the design technical solutions, technologies and procedures that need to be defined and justified in compliance with the scientific and technical achievements and the internationally approved operational expertise is also included.

Limitation of the possible radiological impacts during development of the design and construction of facility for RAW

The main dose limits and constrains which the design has to observe are given in the RBSRP. The range of the detailed technical requirements, and also the criteria for the degree of optimisation of

the radiation protection in designing of NF, are given in *Regulation on radiation protection during activities with SIR* and mainly in the *Regulation on safety in management of RAW*.

For control of these requirements in the legislation a mechanism is determined. The design and construction as stages of the life cycle of the NF are subject of the licensing regime and according to the ASUNE and the *Regulation on the order for issuing of licenses and permissions for safe use of nuclear energy* at earliest stage it is necessary to submit evidences for compliance of the design with all applicable safety requirements. The procedure for issuing of permission for design and approval of the technical design requires from the licensee the submission of Intermediate safety analysis report, that will be reviewed by NRA and that has to contain all the necessary information so that to be confirmed that the possible radiological impacts are limited to the determined acceptable levels. It is required also to submit the results of independent verification of the safety analysis.

Measures for decommissioning and closure at development of the design of the NF

At all stages, including design, of the life cycle of the facility for treatment and facility for storage of RAW, the licensee plans and applies measures facilitating the decommissioning.

ASUNE and the *Regulation on the order for issuing of licenses and permissions for safe use of nuclear energy* require for approval of the technical design the Interim Safety Analysis to include chapter ”Decommissioning” – for nuclear facilities, that are decommissioned, justifying a concept for decommissioning, the adaptation for decontamination and dismantling works and the possibility for release from regulatory control.

In case of facility for disposal the Interim safety analysis report has to include chapter “ Analysis of the safety after closure”- for assessment of the long term stability of the facility and the radiation exposure of the population in normal evolution and in disruption of the protective barriers, including human activity at the site.

Facilities - designed and under construction

In connection with the design permits for units 1 and 2 of Belene NPP issued in 2007, with due dates to 2013 and 2015 respectively, the review of the Interim safety analysis report is going on. The conformity of the design with the legislative requirements, with adopted safety standards and the conditions in the issued permissions, including in the area of management of RAW, is being assessed.

In May 2011 the Chairman of NRA issued permission to KNPP for design of facility for treatment of RAW- Installation for plasma combustion.

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).

Brief review of the information presented within the frame of the previous National Reports

In the first review of the implementations of the obligations of Republic of Bulgaria for the Convention the existing shortcoming were found and subsequently addressed in the Second National Reports. It presents the main statements in this area according to the approved then *Regulation on the safety during RAW management.* The requirements for the safety of the facilities for RAW management, the conformity with which is subject of demonstration by the safety assessment, are determined in it. It identifies the types of the safety assessments, required for the deferent stages of the life of the facility. The relevant requirements and criteria for facilities for disposal of RAW after closure are identified.

Requirements of EIA for implementation of EIA are presented.

Measures for implementation of safety assessment before construction and before operation of facilities for management of RAW

The legislatively determined criteria for safety of facilities for management of RAW are discussed under Articles 24 and 11 of this Report.

The mechanism for control on the application of these requirements is identified in the legislation. In the *Regulation on the procedure for issuance of licences and permits for the safe use of nuclear energy* the requirements for the stages at which it is necessary to develop and actualise the safety assessment are determined.

Before the construction of facilities for management of RAW the development of safety assessments is required for every of the stages for site selection and design. For approval of the site the Preliminary Safety Analysis Report has to be presented to the regulator. At the stage of design for approval of the technical report it is necessary to present the Interim Safety Analysis Report. These requirements are related to facility for management and storage of RAW, and also to facility for disposal.
Before the operation of NF the assessment of the safety of the nuclear facility is actualised according to the results obtained in the process of commissioning. The Final Safety Analysis Report has to be presented for review to the regulator with the application for issuing the license for operation.
The requirements for the structure and content of the safety assessment reports are given in the *Regulation on the procedure for issuance of licences and permits for the safe use of nuclear energy.* It is specified in details what is the necessary information, from which to evaluate whether the possible radiological impacts are within the identified limits and whether they are optimised at acceptable levels

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."

Brief review of the information presented within the frame of the previous National Reports

The requirements of the legislation, made in connection with the provisions of article 16 of the Convention are presented.

The requirements for safety during operation of a facility for management of RAW are given in the ASUNE and in the *Regulation on the safety during RAW management*. Some of the requirements are common for all NF, others are specific for the facilities for management of RAW.

Commissioning permit for the RAW management facilities

The RAW management facilities are subject to the same licensing procedures in Republic of Bulgaria for operation of nuclear facilities according to the *Regulation on the procedure for issuance of licences and permits for the safe use of nuclear energy*. The issuance of an operational license and the necessary conditions for that are discussed in detail in article 9 of this report.

The basic document, on the basis of which the license is issued, is the Final Safety Analysis Report, in which the results from the commissioning of the nuclear facility are taken into account. Documents from implementation of the Programme for commissioning and from the implementation of the conditions of the issued permits are also presented in the review. A commission of NRA inspectors ,that checks the presented by the applicant documents and performs inspection on site has verified the implementation of the conditions of the permit for commissioning.

Except that, for issuing of license for operation of facility for management of RAW it is necessary to develop criteria for acceptance of RAW in the facility and technical specification of the packages of the conditioned RAW.

For issuing of license for operation of facility for disposal of RAW it is required to have plan for closure of the facility and control. In such case the safety assessment report has to include assessment of the safety of the facility for the period of operation and post-closure period.

The license for operation is issued for maximum term of 10 years. For renewal of the license for operation with the application, an actualised safety analysis report of the nuclear facility is presented, in which the actual legal requirements and the foreseen operational term are taken into account.

In 2010 NRA issued licenses for operation of units 1 and 2 as facilities for management of RAW, after declaration for that in December 2008 by decision of the Council of Ministers. The licensee is SE RAW. In 2011 the license for operation of SE RAW – Novi han SD was renewed.

Operational limits and conditions

The *Regulation on the safety during RAW management* determines as a main requirement for safety the development of internal rules, regulations, procedures and instructions containing operational limits and conditions for the RAW management facilities. The *Regulation on the procedure for issuance of licences and permits for the safe use of nuclear energy* requires with the application for

issuing of license for commissioning of nuclear facility in NRA to be presented limits and conditions for operation, including:

- safety margins;
- values of the parameters for actuation of the safety systems;
- operational limits and conditions ;
- responsibilities of the personnel, supervision and operational control of the systems, important for safety
- staff arrangements in case of incidents and accidents

The limits and conditions for operation are part of the main operational document – the technical specifications for operation of the nuclear facility, that contains also the rules for safe operation and the common order for implementation of the technological operations, related to safety.

Every change in the technical specifications, respectively the limits and conditions for operation, is subjected to permission regime.

Conformity with the established operational procedures

The requirements for availability of procedures for operation, technical maintenance, monitoring and others are determined in the legislation.

The conformity with the legal requirements and the adequacy of the procedures is checked in the frames of the licensing regime at issuing of licenses and permits and at the current control on the implementation of the conditions of the issued licenses and permits.

Application of the procedures is subject of topical inspections according to the annual inspection plan of the regulatory body, and also of the control of the implementation of the given recommendations and prescriptions.

Engineering and technical support

The ASUNE requires availability of the relevant engineering and technical support in all areas, related to the safety during the whole term of operation of the facility.

A license is issued to a legal entity, that has financial and technical resources and enough qualified staff with the relevant level of education and training and preparation for all activities of the license.

Waste characterisation and sorting

The requirements are regulated in the *Regulation on the safety during RAW management.*

The licensees have developed and applied procedures for characterisation and sorting of the RAW that they manage with due consideration to the specificities of the technological process and the interrelations among the various stages of RAW generation and management.

The RAW characterisation procedures at KNPP are oriented to the determination of their characteristics taking into account the possibilities for next sorting, treatment and conditioning, and also the radiation protection of the personnel engaged in RAW handling. The release of the materials from regulation is also an important aspect to which the operators pay more attention.

A wide range of investigations for characterisation of the liquid RAW in KNPP are conducted in the aspect of determination of difficult to measure radionuclides, important for long term safety. Similar investigation, that is condition of the license for operation of SE RAW-Kozloduy, is being conducted for the solid RAW, operational and historical, and it has term of implementation 2012.

A project for characterisation of spent sorbents started in KNPP.

Information related to projects for characterisation of RAW and radiological investigation in units 1-4 of KNPP is presented in chapter K of this report.

Reporting of events. Analysis of the operational expertise

According to article 19 of ASUNE, in all operational licences for operation of NF, the requirements for reporting of safety-related incidents should be included. The reporting terms 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*. In the period 2008-2010 in the facilities for management of RAW there are no registered operational events, that have to be reported according to the criteria of the regulation.

In implementation of the requirements of Article 16 of ASUNE the licensees develop and apply procedures for analysis of their own operational experience to perform assessment of nuclear safety and radiation protection of the nuclear facilities and to take measures for their improvement taking into account the own and the international operational experience and the scientific knowledge in this area.

An instrument for review and analysis of the own operational experience is the system of indicators, developed by the operator of every NF as a condition of the issued licenses for operation. The results from the review of the status and the tendencies are presented periodically to the regulatory body.

Plan for facility decommissioning / closure

In accordance with the *Regulation on decommissioning of nuclear facilities* and Regulation *on the procedure for issuance of licences and permits for the safe use of nuclear energy* it is required to update periodically the plan for decommissioning for issuing and re-issuing of the operation license In the same time the costs assessment for decommissioning is actualised. The actual plans are subject of review by the regulator in the frames of the process of issuing and renewal of the operational license.

In the case of facility for disposal of RAW a plan for closure is presented.

At actualisation of the plan for decommissioning /closure the actual legislative requirements and the current status of the nuclear facility are taken into account.

Information about the degree of development of the plans for decommissioning of shutdown facilities is given in this report under article 26.

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 framework of the previous National Reports

The requirements for institutional measures following the closure of RAW disposal facilities are included in the national legislation after the First review of the fulfilment of the obligations of Republic of Bulgaria for the Convention.

In the Second Report are presented the requirements about the duration of the institutional control, defined in the *Regulation on the safety during RAW management* – active and passive control , with definition of the maximum and minimum terms of their implementation.

The *Regulation on the safety during RAW management* regulates the intervention in the event of unplanned releases in the post-operational period and closure of the RAW disposal facility with respect to the intervention levels, stated in the *Regulation on emergency planning and emergency preparedness in case of nuclear or radiation accident.*

Preservation of information

The *Regulation on the safety during RAW management* sets the requirements for management of the process of documentation of the activities in NF.

The legal enteties, implementing the RAW management activities apply quality system, that guarantee keeping of account, control and archiving of the main characteristics of RAW:

- data for the origin and place of receiving, category and amount of RAW, methods for processing, storage and disposal
- radiation characteristics, like total and specific activity, radionuclide content, fissile material, dose rate on the surface of the package and surface contamination;
- chemical characteristics, like chemical content, chemical stability, pyrophoreness and combustion, gas generation, toxicity, degradation of organic substances
- physical characteristics like density, homogeneity, free space and materials that have influence on the physical properties;
- mechanical properties , like stability on stress and pressure;
- thermal properties like heat conductivity, heat removal, stability on temperature stress;
- biological properties like biological degradation;
- shielding and containers.

The legal entities, implementing the RAW management activities are obliged to store these data till transfer to a person, responsible for the subsequent management of RAW, but not less than 50 years. The operator of the facility for disposal of RAW is obliged to develop and apply operational procedures and instructions, that determine the organization for records keeping and control of the documentation.

Institutional control and measures for intervention

According to the *Regulation on the safety during RAW management* it is required the closure of the facility for disposal to be performed in compliance with detailed plan, containing also description of the measures for institutional control after the closure including:

- phases and duration of the control;
- programme for radiation monitoring of–site, in the area for preventive protective measures and in the surveillance area;
- programme for control of the status of the facility;
- system for preserving the information for the facility;
- justified proposal for an organisation, responsible for further application of the planned measures

The plan for closure of the facility is prepared by the operator of the facility and is presented to the BNRA Chairman for approval not later than 3 years before the beginning of the activities for closure of the facility.

The control after the closure of the facility for disposal of RAW is performed by state institutions with rights for applications of planned measures. The active control includes monitoring, access

control, minimal technical support of the infrastructure of the facility. During the period of passive control it is necessary to apply administrative measure for control of the use of the land.

The implementation of the active corrective measures and remediation activities at the site during the active control in case of established non compliance between the results from the performed monitoring and the safety assessment of the facility is allowed only in proved by assessments and analyses necessity and effectiveness of the planned activities.

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."

Brief review of the information presented within the framework of the previous National Reports

It has been pointed out that export and transport of nuclear material, and SF in particular, are subject to permit issuance; the requirements for issuance of a permit for export and transport of SF are defined by the ASUNE

It is noted that the Republic of Bulgaria has experience only as a State of origin of spent nuclear fuel. Presentation is made of the international agreements related to receiving of SF for processing on behalf of the Russian Federation, and its transit through the territory of the Ukraine.

A description is provided of the scheme for spent fuel transport via railway and water.

The requirements in the *Regulation on the procedure for issuance of licences and permits for the safe use of nuclear energy* as regards the implementation of the obligations in this article of the Convention are presented. It has been pointed out that the following documents must also be attached to the application for issuance of a permit for transport of nuclear material:

- transport permits or their respective authorisations issued by the competent authorities of the State of destination and the states through which transit movement will be made - in case of nuclear material export;
- documents that regulate the relations between the consignor and the consignee, and between the applicant and the subcontractors related to the transport performed on the territory of the state;
- authorisations issued by the respective competent authorities for approval of the overpacks in compliance with the *Regulation on the conditions and procedure of transport of radioactive material* ;
- documents certifying that in case a transport cannot be performed or the transport conditions cannot be fulfilled, the consignee will return the consignment to the point of departure while the consignor will receive the consignment.

It has been stated that the requirements for safety during transport of SF are defined in the *Regulation on the conditions and procedure of transport of radioactive material,* that has been developed in consistency with the provisions of the IAEA document *Regulations for the Safe Transport of Radioactive Material, TS-R-1*, as well as the requirements of the respective international rules for transport of dangerous goods:

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

Changes in the regulatory basis related to transboundary movement of SF

By amendments to the ASUNE enforced in October 2010 the national legislation has been harmonized with the provisions of Directive 2006/117/EURATOM. The main changes are:

- In case of transit of SF or RAW a Council of Ministers decision is not required anymore;
- The usage of a "standard document" as described in the Directive 2006/117/EURATOM has been introduced;

SF transboundary movement practice

Throughout the period after the issuance of the Third National Report permits have been issued and transboundary movement of SF has been made as follows:

- 2009 – from reactors WWER-440 – 1 shipment
- 2011 - from reactors WWER-440 – 1 shipment

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."

Brief review of the information presented within the frame of the previous National Reports

It is pointed that the activities with sources of ionising radiation (SIR) is subject to permit issuance as provided for in the ASUNE and the *Regulation on the procedure for issuance of licences and permits for the safe use of nuclear energy*. While implementing such activities the Regulation on the BNRP-2004 shall be adhered to as well as the specific requirements in the *Regulation on radiation protection during activities with SIR*.

NRA keeps *National register for sources of ionising radiation in Republic of Bulgaria* with information about all sealed radioactive sources category 1 to 5 and for the licensees and permission holders, that stored and use them .

When a source is no longer in use it is treated as radioactive waste and pursuant to the ASUNE it has to be transferred to an organization licensed to manage RAW. The disused sealed sources are handed over to the SE RAW – Novi Han SD for centralized storage. The NRA is notified on each source transfer.

In cases when the owner of sealed sources is unknown or the licensee declare bankruptcy, the source becomes state property and the Chairman of the BNRA issues an order for the source to be transferred to SE RAW.

The undertaken by Republics of Bulgaria measures are presented, great part of which are implemented together with the USA government and EU, for discovering of sources of unknown owner and for preventing of illicit trans-boundary traffic of sealed sources. The measures are:

- use of modern technical means and application of standard procedures at implementing of the border control for nuclear and radioactive materials

- implementing of preventive control in the enterprises, working with scrap

-ensuring of physical protection in sites with radioactive sources

Management of disused sealed sources

In 2010 changes, related to activities with radioactive sources, including spent sources, are introduced in the ASUNE. To relax the activities a special approach is proposed, in order to replace the licensing and permission regime for certain category of SIR with low radiological risk, used in medicine and industry, with informing regime, ensuring possibility for control later. The maximum term of the issued licenses for usage of SIR is prolonged from 5 to 10 years.

The import of sealed sources category 1, 2 or 3, which half life is longer than 5 years can be performed only if their return to the manufacturer is ensured after the termination of their usage.

The ensuring of the physical protection of the radioactive sources and materials is introduced as a basic requirement for the use and storage of SIR.

The storage of spent sealed sources is subject to permit issuance, but decentralised storage is yet palliative measure for safety in the process of their management. To motivate the licensees to transfer without delay the spent sources to SE RAW for long term storage in the SE RAW – Novi Han SD, that is licensed facility by NRA for management of RAW, the due state taxes have been reduced during recent years.

With the construction of the National Repository for Low and Intermediate Level RAW, planed to be commissioned in 2015, the problem of disposal of significant part of the stored now spent sources will be solved.

For the period 2008-2010 SE RAW has accepted for storage sealed sources by type and activity as follows:

Year	2008	2009	2010
Contracts	130	77	48
Accepted fire detectors / SIR	7248 / 10527	4968 / 6527	2006 / 2533
Other sealed SIR	17003	1827	3462
Total activity, [TBq]	1.034	1.797	0.326

The reduced number of disused SIR, transferred to Novi han repository site shows that during the recent years the problems with collection from the owners of spent sources from industry, science and medicine, are properly solved.

The handover activities with radioactive sources declared as RAW are carried out in consistence with the *Regulation on the conditions and procedure for transfer of radioactive waste to the state enterprise "Radioactive Waste"*.

Even very rare, in Republic of Bulgaria there are cases of secondary use of spent high radioactive sources. It is performed according to the conditions of the issued by NRA license for use of the source for a given purpose, different from the primary one, for which the source is produced and delivered.

In the Bulgarian legislation the problems related to recycling, secondary use, certification and with prolongation of the term for safe operation of highly active sources are covered partially, that will impose the legislation in this area to be developed taking into account the experience of other countries.

Secondary import of spent sealed sources

The Bulgarian legislation does not forbid secondary import of spent sealed sources on the territory of the republic of Bulgaria, if they have been produced in the country

Applications for permission of such import are not submitted to NRA, because now in Republic of Bulgaria there are no licensed manufacturers of sealed SIR.

SECTION K: ACTIVITIES PLANNED TO IMPROVE SAFETY

The adopted in January 2011 *Strategy for management of SF and RAW till 2030* is a natural extension of the practically implemented previous national programme- strategy since 2004 and poses one further horizon in the area of the management of SF and RAW. The strategy is a basis for planning of activities as for nuclear operators, so for the other organisations in Republic of Bulgaria with responsibilities for safety and control of radiation risk.

The implemented till 2008 planned activities are discussed in the previous reports for the convention. In this report measures that are implemented now and/or are planned for the next 5 years period are included.

1. Construction of the National Repository for Low Level and Intermediate Level RAW

This is the most important national implementation project, stated in the national strategy for RAW management. The construction of the national repository is approved with decision of Council of ministers from 2008.

The project NRRAW is at stage of site selection, which stage should be fulfilled until may 2012, according to the conditions of the issued by NRA permission. The licensee is SE RAW.

It is foreseen the repository to be in modules, near surface, multi-barrier engineering facility, which will allow consecutively construction of the separate elements and increasing of the capacity. The capacity of the construction at the first stage is 50 000 m3.

At the phase of site characterisation detailed investigations of the potential sites " Marichin valog", "Brestova padina" and "Radiana" have been conducted. On the base of comparative analysis, based on system of 23 factors (criteria 0 the potential sites are analysed and classified. The preferred site is determined- site "Radiana", situated near KNPP.

It is planned for the activities for confirmation of the preferred site and development of the documentation for the issuing of order for approval of the selected site according to art. 37 of the Regulation on the order for issuing of licenses and permits for safe use of nuclear energy to be completed in the frames of the above decision.

A report on Environmental impact assessment for investment proposal for construction of NRRAW on the basis of approved by Ministry of Environment and water Statement for determination of the range and content of the EIA has been developed. Public hearings have been conducted in villages Harletz and Kozloduy. In compliance with he requirements of the Convention for EIA in transboundary context, the statement for the range and content of EIA, the report for EIA and the appendixes to it are sent. In 2011 a public hearing of the report took place in Beket, Romania.

Presented reports for completed phases	Status
Report for implementation of the first phase "Development of concept and planning of activities "submitted to NRA for review	Approved by NRA
Report for implementation of phase "Collection of data and analyzing of the regions"	Approved by NRA
Report for implementation of phase "Characterization of the sites"	Approved by NRA
Plan for realization of phase "Confirmation of site for NRRAW and QAP for the same phase"	In process of review by NRA

Projects financed by the International Fund :Kozloduy”	Description
R-Project 1 Development of detailed geodesic map of site ”Radiana”	Geodesic mapping and development of detailed geodesic map with aim to ensure the next activities on development of detailed structure plan- plan for regulation and building construction Completed 2009г.
R-Project 2 PR-support of EIA procedure	Ensuring public acceptance of EIA report
R-Project 3 Preliminary monitoring of the site Radiana	Preliminary monitoring of the preferred site, including hydrological monitoring and geo-chemical analyses, radiation monitoring and seismic monitoring. The project is in stage of preparation of tender procedures
R-project 4 Preparation of site Radiana	Ensuring of physical protection and preparation of the part of the infrastructure of the site. The project is in preparatory phase
R-project 5 Development of technical project and interim safety analysis report of NRRAW	Development of conceptual design with variants development of technical design and interim safety analysis report. The project is at stage of tender procedure
R-project 5a Independent evaluation of the interim safety analysis report	Implementation of independent evaluation of the ISAR. The project is at preliminary stage.
R- project 5б Independent evaluation of the conformity of the technical design with the requirements of Act for territorial structure	Implementation of independent evaluation of the conceptual design and development of technical design in compliance with the requirements of the Act for territorial structure. The project is at preliminary stage.
R- project 6 Comparing migration investigations	Conducting of comparative migration studies of the potential sites . The project is completed 2010 г.
R- project 7 Engineering- geological and hydrological field and laboratory studies of the plate part of site Radiana	Conducting of additional studies of the preferred site Radiana. Term for completion 2011 г.

2. Disposal of high level RAW

Concerning the SF the National strategy does not exclude a prior discussion of any three possible options:

1. Treatment in other countries, possessing potential for extraction of substances from SF for further use in reactor installations without return of high level active waste for disposal

2. Treatment in other countries, possessing potential for extracting of substances from SF for further use in reactor installations with return of high level active waste for disposal

3. Disposal of SF on the territory of the country.

For the high active RAW it is necessary to make common decision for disposal together with low and intermediate active long-lived RAW. Now the SE RAW implements activities related to the

preliminary study of the possibilities for construction of deep geological repository. In the frames of these studies a review of the world experience, the available legislative and technical literature in the area is made. In details are analysed the results from the recent studies and investigations of the natural (mainly geological) conditions on the territory of the country and assessment of the given social-economical factors, having relation to the evaluation of possibilities for construction of deep geological disposal,

As a result from these activities a preliminary zoning of the country is made on the basis of developed system of criteria for excluding, taking into account the specific conditions in our country. A summarised map is made, in which three regions of interest are identified, namely: North-western, Central north and Eastern region of interest. By using criteria for choice in the regions of interest 5 potential areas are localised, which characteristics in maximal degree correspond to the determined preferred natural conditions, characteristics and requirements. For every of the perspective areas an analysis of the geology-tectonic, geo-morphologic, neo tectonic, seismic, hydro-geological and engineer-geological and sociological economical characteristics is performed. On this base 6 potential geological blocks are localised, that can be additionally investigated. The potential host media are thick clay mergels and granites.

For every block principal technological schemes are developed, as well as schedules and the foreseen size if the investments for construction of deep geological repository. All activities performed till now by SE RAW can be determined as project study in compliance of Order No 4 for the range and content of investment projects.

3. National legislation in the area of management of SF and RAW

A balanced approach is adopted for permanent improvement of the legislation. In 2010 ASUNE is amended and the main changes of which are presented in the report in art.19.

A work for development of new and actualised acting regulatory guides for application of the regulations is going on.

4. Planned activities for increasing of safety of existing NF

4.1 RAW-Kozlody SD

4.1.1. The planned activities in Programme for increasing of safety of the activities for management of RAW from KNPP are completed.

4.1.2. The programme for management of RAW at the Lime plant site is in implementation, with which a steady speed of treatment of the stored now not treated historical RAW is kept.

4.1.3 At advanced stage of implementation is the project on characterization of radioactive waste from Kozloduy. Subject of the study is important for the long-term safety difficult to measure, whose direct determination by direct measurements in the processing of waste is practically impossible.

Completed is part of the characterization of liquid radioactive waste from the Kozloduy nuclear power plant, in 2012 it is expected to complete the activities for characterization of solid waste from the Kozloduy NPP.

4.1.4 Preparatory work has been carried out for the commissioning of a repository for contaminated soil, rubble and other bulk techological waste with very low levels of radioactive contamination. A program to survey the status is implemented , a project documentation for rehabilitation measures is developed, which implemenation is forthcoming. A report on the safety assessment of the facility is developed.

4.3 Kozloduy NPP

4.3.1 Processing of solid phase in Tanks for Residue Waste liduid radioactive concentrate
Radioactive liquid concentrate (bottoms residue, CA) is stored in a total of 10 tanks , in which there

in also a solid phase presented. In accordance with the Strategy for the decommissioning of units 1-4 it is necessary to release the tanks and waste from them to be processed.
Liquid phase is extracted and conditioned in facilities of SE RAW-Kozloduy and now all amount of concentrate in Auxiliary building -2 is already processed.

A project for delivery system for the extraction and processing of solid phase from the tanks is going on. The project is divided into two phases. At 30.06.2011, the first phase is implemented - sampling and characterization of radioactive waste. The problems with the technical means for sampling are currently solved in the course of implementation.

4.3.2 Transport of liquid radioactive waste from tanks in Auxiliary building-1 to Auxiliary building -2

The technical solution for transferring liquid RAW from Auxiliary building-1 to SE RAW is implemented.

Using the existing technological connections a bottom residue is transferred to the tanks from the Auxiliary building-1 to the Auxiliary building-2, from where by the existing extracting system the decantat is transported with specialized transport tanker to SE RAW.

4.3.3 Implementation of the treatment plant of low level liquid radioactive waste

The project for the supply of non-stationary modular equipment for handling and processing of contaminated water from laundry, bathrooms and other contaminated water from Units 1 and 2 of Kozloduy NPP and conditioning of received radioactive waste is at a stage of commissioning.

4.3.4 Implementation of methods for processing and conditioning of radioactive waste with high coefficient of volume reduction

The project is to build a treatment facility for solid low-activity waste from the operation of Units 1 to 6 of Kozloduy NPP, and also during the first steps of decommissioning. It is envisaged to use advanced plasma technology, which will provide a significant reduction of the initial volume of waste. The final product - conditioned radioactive waste must be suitable for transportation and interim storage in the facilities at Kozloduy NPP. The project is at the stage of elaboration of technical project, for which a permission is issued by the NRA

4.3.5 Conditioning of spent ion exchange resins

The project is for the supply of installation for extraction and conditioning of spent ion exchange resins in the tanks of Auxiliary building-1 to Auxiliary building -2 of Kozloduy NPP.

Technical design of the facility is prepared. The requirements to the final product are specified. The procedure for assigning the necessary activities for full characterization of the resins is going on.

5. International cooperation in the management of radioactive waste and spent fuel
Considering the comprehensive benefits, Bulgaria will continue its participation in international organizations, initiatives and projects, including:
WENRA - in the development of reference levels for safe management of radioactive waste and SF;
ERDO (European Organisation for the development of repositories for radioactive waste disposal) - based on current project activity SAPIERR development of European regional repositories;
Committee to support the decommissioning of nuclear facilities to the EC (NDAPC) and the **International Fund for supporting the decommissioning of Kozloduy** (KIDSF) - adopting the planned activities for decommissioning, which is funded by the International Decommissioning Support Fund of operation of Kozloduy (KIDSF), administered by the EBRD;
IFNEC (international framework for nuclear energy cooperation) - for development and use of modern technologies in the nuclear fuel cycle in order to substantially reduce nuclear waste, simplify storage and disposal, and to reduce the quantities of spent nuclear fuel from civilian applications in a safe and secure manner, protected from illegal proliferation of nuclear materials.

SECTION L: ANNEXES

Annex L-1

List of the spent fuel management facilities, their location, main purpose and key characteristics

Annex L-2

Spent fuel report

Annex L-3

List of the radioactive waste management facilities, their location, main purpose and key characteristics

Annex L-4

Radioactive waste report

Annex L-5

List of the international agreements, laws and regulations applicable to the spent fuel management facilities and the radioactive waste management facilities.

Annex L-6

Human and financial resources

Annex L-7

Brief outline of the projects funded by KIDSF and managed by the PMU on decommissioning of Kozloduy NPP units 1-4

Annex L-1

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

I. NPP "Kozloduy

I.1 Wet spent fuel storage facility

The wet spent fuel storage facility (WSFSF) 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 project capacity of spent fuel storage facility is 168 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 WSFSF.

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.

WSFSF 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 WSFSF 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 WSFSF 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 centre, 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 WSFSF provides biological protection (the reinforced concrete walls and the pool bottom have a thickness of 1.5 m);
- 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, as well as they were situated inside the reactor;
- 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 WSFSF 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 unfavourable temperature conditions of the environment).

An additional safety assessment of the WSFSF 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 WSFSF 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 WSFSF was not detected any necessity of supplementary anchoring of the transport baskets.

In order to justify the potential term of long-term safe enclosure of the assemblies under water, in 2006 “accelerated corrosion tests” were conducted again using a specially developed method statement that allows modelling the impact of a corrosive (aqueous) medium with a storage period of 50 years. The complex non-destructive and destructive examinations of the fuel rods and the other design elements of a type assembly with spent nuclear fuel of WWER-440 and WWER-1000 after a prolonged storage under water; the studies with hydrogen saturation and determining the mechanical characteristics of the fuel rod metal cladding; the accelerated corrosion tests and the analysis of the results from other tests have confirmed the satisfactory condition of the cladding following 50 years of underwater storage, provided that the specified water chemistry is adhered to.

Evaluation has been made of the condition of the structural materials, the pond lining and the transport storage baskets. Their integrity has also been preserved. Their corrosion resistance for a 50-year period of operation of the storage facility has also been confirmed.

In 2004 a Safety Assessment of the WSFSF was made, on the basis of which the NRA issued an operational licence of WSFSF until 2014.

In 2005 a Technical Specification for operation of the WSFSF updated with the new requirements of the regulatory documents was approved. The project for Modernisation of the radiation monitoring system was delivered (replacement of the instrumentation with modern one capable of on-line recording in the data base of the readings.

In 2006 the areas for fuel receiving and refuelling were furnished with a refuelling machine for WWER-440 and WWER-1000 assemblies. The protection and interlocks system was replaced by a digital one (using programmable logic controllers, PC, etc.).

In 2007 analyses were made to determine the lifetime of the WSFSF building and equipment.

In the operational license of WSFSF includes the activities of loading containers type CONSTOR® 440/84 with SF.

I.2 Reactor ponds - 3, 4

SFP-1 and SFP-2 are discharged of SF on 27.08.2008 and 08.08.2009, respectively. After that they are owned by SE RAW and since 18.10.2010 they are licensed as RAW management facilities and they are not considered as SF management facilities and are not subject of this annex.

The reactor ponds are used for short-term storage of the assemblies once they have been taken out of the core, and the objective is to reduce their activity as well as their decay fuel removal prior to being transferred to the WSFSF or transported to Russia.

The regulated term for storage in the reactor pond is 3 years if the SF will be transferred to the WSFSF and 5 years if it will be transported to Russia.

The nuclear safety of the reactor ponds is ensured by the design, namely by the spacing of the grid, which provides a minimum of 5% subcriticality during the SF storage and at a maximum effective multiplication coefficient (the pond fully taken by fresh fuel, absence of soluble neutron absorbent (H3BO3) from the water, and at 20˚C water temperature)

The cooling system provides mandatory decay heat removal and temperature in the reactor ponds is maintained within the 20÷50˚C range (under no circumstances should it exceed 65˚C), with the pond completely filled with SF, including holding the assemblies after a full "hot" unloading. Emergency cooling of the reactor pond heat exchangers is provided by additionally installed emergency make-up water system on each unit, as well as additional emergency make-up water system in case of reactor pond leakage that exceeds the pump flow rate of the filling system**.**

The coolant treatment system removes fission or corrosion products from the water, and ensures the required transparency of the reactor ponds.

The design of the reactor pond for WWER-440 assemblies consists of two rows of racks: the upper layer can be dismantled while the bottom one is fixed. Each row has three sections. The total capacity of reactor ponds 3 and 4 is 728 and 726 assemblies, respectively.

When the reactor unit is in on-load operational mode, the SF is stored only on the lower rack of the reactor pond and the upper rack is then used for temporary storage - if re-arrangement is needed and during refuelling (for instance when the core is fully unloaded to the spent fuel pond).

Currently, units 3 and 4 hold operational licences for operation in E mode - storage of SF in the reactor ponds. The fuel in reactor pond 3 has been placed on one row of racks since 19.11.2009 and in reactor pond 4 – since 20.11.2009, before those dates the SF was placed on two rows.

The SF from reactor ponds 3 and 4 is periodically transported. The transport schedule follows the schedule for the rated storage time allowing for the SF to be moved.

The reactor ponds 3 and 4 also hold for storage other elements of the core, such as control rod absorbers and dummy fuel assemblies that do not contain nuclear material.

1.3 Reactor ponds – 5 and 6

The fuel storage and refuelling ponds (SFP or reactor ponds) are located in the unit containment area. The spent fuel is stored there in order for the decay heat to be brought down to admissible levels. The ponds also serve for temporary storage of control rod absorbers and dummy fuel assemblies. Each spent fuel pond consists of 4 compartments physically separated by partition walls up to elevation 28.93. Above elevation 28.93 up to 36.2 the pond volume is common. Three compartments are allocated for immediate storage of the spent assemblies, while the fourth compartment is used for transport and handling operations with fresh and spent fuel. The SF overpack, the fresh fuel baskets and the baskets holding hermetic storage tubes are placed in the fourth compartment. The racks and hermetic storage tubes for accommodating and storing of assemblies are inside the fuel storage compartments.

The racks are manufactured from borated steel and they ensure subcriticality in the pond not lower than 0.05 in case of design initiating events, including the drop of a heavy object. The absorbing capacity of the rack cells is preserved over the entire operational period. The reactor pond rack is designed to ensure that:

- the fuel assemblies and the hermetic storage tubes are positioned vertically inside the pond;
- mechanical damage is prevented on the surface of the assemblies while they are being placed or taken out of the rack's guide frames;

- the assemblies and the hermetic storage tubes have been fixed to the rack;
- the decay heat of the spent fuel assemblies is reliably removed;
- the racks shall preserve their functionality at the seismic impact of a design shutdown earthquake;

Each SFP has a load capacity of 612 fuel assemblies and shall assure storage of the spent fuel assemblies not shorter than three years, as provided in GOST.95.7.5-87;

The separation of the SFP into three compartments allows for maintenance works to be carried out in one of them while the spent fuel assemblies have been placed in the other two compartments;

The area assigned for loading of the overpack (transport container) is called "universal load location"; it has been separated from the assembly storage area so that in case of a container drop, the fuel elements will not be damaged or, in case an assembly has been taken out, the level of the boron solution ensuring the assemblies are submerged and protected will not diminish.

The fencing structures of the SFP are intended to hold back the cooling boron solution (which may contain radioactive products) and also to decrease the ionizing radiation;

The SFP fencing structures consist of the following elements:

- The double metal lining has a drain for any potential leaks. The space between the two walls with lining is filled with drainage (porous) concrete thus forming an enclosed common hollow space with the floor and the walls, enabling to keep track of potential leaks through the lining. In the floor between the two walls there are drains (one for each SFP and universal load location) that run to a room where it is possible to inspect visually for any leaks.
- Reinforced concrete fencing structures

The design of the structures fencing the SFP has taken into account the following principles:

- Preserve the functional attributes (tightness and strength) under different operational modes, including safe shutdown earthquake;
- Ensure shielding in normal operation modes and design basis accidents;

The spent fuel pool and the entire system are filled with boric acid solution, with a concentration of 16 g/kg.

The pond is filled up to elevation 28.83 in fuel long-term storage mode. In the refuelling mode (when transport handling with the fuel is envisaged) the pond is filled to elevation 35.7. Thus, movement of the fuel underwater is ensured. To prevent pond overfilling, there are two overflow devices in each compartment of the pond - one at the water level for long-term fuel storage (28.8), and the other at water level for refuelling (36.2). If the water level needs to be maintained at 35.7, the operator shall close the isolation valves corresponding to level 28.8. The fuel storage compartments do not have service drains at the bottom part which guarantees they cannot be drained empty and leave the SNF without coolant.

In the operational modes when there is no fuel movement, the top part of the pond is covered by plates. To avoid the plates breaking and falling in the pond, they are designed to withstand an earthquake with a magnitude of 9 on the MSK-6 scale and shock wave impact all over the plate surface with a force of 148 kN (14.8 ts/s) in case of a main circuit pipeline rupture. The plates can withstand shock loads in the event of objects with a mass of 5 kg dropping from 10 m height (i.e. small size tools dropped from the under crane structures).

In the top part of the pond there is ventilation, suction-supply system that ensures an air screen preventing the spread of gaseous aerosol products from the SFP surface to the main room. Thus, the service personnel in the containment is protected in refuelling modes or unit maintenance modes.

The cooling system consists of three channels, three pond cooling pumps, three heat exchangers at the suction part of each pump, pipes and valves. The channels are joined by means of a connection of the suction and the discharge pipes, which permits switching from one channel to the other in the event of a failure of any of the channels. Three fast acting localizing valves are installed at both the discharge and the suction pipes, one of the valves being placed in the containment. The heat exchangers are cooled by the service water system for significant users, and each TG channel is cooled by a separate channel.

The performance capacity of each of the three channels is such that each of them can ensure heat removal from the reactor pond under any of the system operating modes.

II. Dry Spent Fuel Storage Facility

The DSFSF is situated within the fence boundaries of the Kozloduy NPP in west direction from the existing WSFSF.

The DSFSF is designed for long-term storage of SF from WWER-440 reactors of Kozloduy NPP. It is equipped with systems for receiving, storage and shipment of casks with SF.

The general characteristics of the DSFSF are:

- The DSFSF is a standalone one storey construction divided in two areas – reception hall and storage hall;
- The floor plate of the DSFSF, the external walls and walls between reception and storage halls are made from reinforced concrete. The construction of the reception hall is made from reinforced concrete pillars and welded shaped steel. The cover plates made from corrugated iron with fire resistant isolation ensure the protection from atmospheric influences and heat isolation of the building. The storage hall has the same characteristics as the reception hall. A reinforced concrete pillars are used to support the roof and the crane. A steel constructions are used for the main support roof girders (frames). The roof coverage is made from metallic three-layer plates.
- The reception hall and storage hall are serviced by a bridge crane with a hoisting capacity of 145 tons;
- The SF is stored in CONSTOR-440/84 casks;
- The DSFSF's capacity is 78 casks.

The container consists of an enclosure with a basket, a closing system of the container with the first cover, sealing plate and footstep bearings. The enclosure of the CONSTOR® 440/84 type container is used as a chamber for incorporating the basket and the fuel assemblies. The container enclosure is a "sandwich" type with external and internal shell of fine-grained steel. There is an intermediate layer of CONSTORIT (granulated material with a cement solution) between the external and internal shells, as well as tensioning studs. The external shell, the CONSTORIT layer, and the cement solution provide the protective gamma irradiation shielding, and the neutron irradiation is mitigated mainly through water in the cement solution. 124 steel coiling plates in total are welded to the surface of the external shell.

The first cover closes the interior of the containers at its upper end. The sealing plate, which is the fist independent sealed barrier, is located between the first and second cover. After placing the sealing plate in the socket of the main sealing ring, the plate is welded to the container enclosure.

The second cover is the second independent sealing barrier. It is located above the sealing plate and above the intermediate steel plate and closes the container at its upper end at the main ring. It is made from the welding fine-grained steel and provides additional shielding. The second cover is hermetically welded in the socket of the main ring with the container enclosure.

The system provides hermetic shells of the spent fuel in the conditions of normal operation and accidents. The qualified large welds and the welding procedure for the welding the sealed plate and the first cover ensure the same quality of the welds as the factory welds of the container enclosure, and have a standard for pressurized vessels.

The container internals where the spent fuel is located is dried out through a qualified process of container vacuum evaporation and the container is filled with helium. The inert atmosphere of the container internals does not allow the fuel rods to corrode for a long-term storage.

The passive system of the Dry Spent Fuel Storage Facility for natural cooling through the air convection and the design of the containers for optimal heat exchange (from the enclosure of the fuel rod to the external shell of the container) prevents from exceeding the temperature limits of the enclosure of the fuel rods and aging process of the structure of the fuel assemblies and the container.

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 31.12.2010 contains 910 tones heavy metal /HM/. This amount is distributed into 5256 spent fuel assemblies from WWER – 440 and spent fuel assemblies from WWER – 1000, total of 6024 spent fuel assemblies are stored.

Spent nuclear fuel inventory in SFSF at 31.12.2010

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	7	826	**4518**	**519792**
WWER-440	124	2.4	104	12124		
WWER-440	136	3.6	3806	439645		
WWER-440	216	1.6	9	1007		
WWER-440	224	2.4	435	48764		
WWER-440	236	3.6	157	17426		
WWER-1000	A	2.0	12	5138	**96**	**40345**
WWER-1000	Г	3.3	84	35207		
TOTAL					**4614**	**560137**

Spent nuclear fuel and havy metal inventory in at-reactor SF ponds – 3 - 6 at 31.12.2010 г.

Reactor type	Assembly type	Initial enrichment at ^{235}U [%]	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]**
WWER-440	116	1.6	2	237	0		**2**	**237**
WWER-440	124	2.4	12	1422	6	713	**18**	**2135**
WWER-440	136	3.6	314	36372	330	38601	**644**	**74973**
WWER-440	216	1.6	1	114	7	799	**8**	**913**
WWER-440	224	2.4	12	1369	6	674	**18**	**2043**
WWER-440	236	3.6	24	2691	24	2688	**48**	**5379**
TOTAL			**365**	**42205**	**373**	**43475**	**738**	**85680**

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	В (3000)	3.0	1	389	1	391	**2**	**780**
WWER-1000	Г (3300)	3.3	1	422	20	8372	**21**	**8794**
WWER-1000	ГВ (3330)	3.3+3.0	0		2	842	**2**	**842**
WWER-1000	ЕД (4230)	4.4+3.6	124	47588	120	46052	**244**	**93640**
WWER-1000	Е (4400)	4.4	85	32502	108	41299	**193**	**73801**
WWER-1000	N 3536	3.53	60	24765	61	25162	**121**	**49927**
WWER-1000	N 3996	3.99	0	0	5	2073	**5**	**2073**
WWER-1000	N 4306	4.3	36	14759	48	19734	**84**	**34493**
TOTAL			307	**120425**	365	**143925**	**672**	**264350**

TOTAL FOR KOZLODUY NPP

Reactor type	Number of Assemblies	Heavy metal mass [kg]	Estimated activity [Bq]
WWER-440	**5 256**	**605 472**	**1.2×10^{19}**
WWER-1000	**768**	**304 695**	**2.4×10^{19}**
TOTAL	**6 024**	**910 167**	**3.6×10^{19}**

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 N3536, N3906, N3996, N4306, and N4386 respectively.

Annex L-3

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

1. KOZLODUY NPP FACILITIES FOR RAW MANAGEMENT

1.1. Auxiliary Building - 1

The storage facilities are designed for temporary storage of solid waste class 2 (additional categories 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 RAW 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 ambient 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^{o}C, 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^{o}C, 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.

After October 2010 operator of the facility is Decommissioning SD –Kozloduy of SE RAW.

1.2. Auxiliary building - 2

The storage facilities are designed for temporary storage of solid RAW class 2 (additional categories 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 – 2 (AB-2), serving units 3 and 4.

Their characteristics are the same as of AB-1.

1.3. Auxiliary building - 3

The storage facilities are designed for temporary storage of solid RAW class 2 (additional categories 2-I, 2-II and 2-III), low and intermediate level liquid radioactive concentrates, 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 RAW class 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 RAW 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 RAW class 2 (additional category 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 construction providing the necessary biological protection. Operating conditions – room temperature, atmospheric pressure.

After October 2010 operator of the facility is Decommissioning SD –Kozloduy of SE RAW.

1.5. Storage facility in reactor hall - 2

It is designed for temporary storage of solid RAW class 2 (additional category 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-1.

2. SE RAW FACILITIES FOR RAW MANAGEMENT

2.1 RAW –Kozloduy SD

2.1.1. RAW processing plant (RAWPP)

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

The conditioning process includes:

- extraction of the liquid RAW from the KNPP tanks for liquid radioactive concentrate;
- transport to the RAWPP;
- concentrating of the liquid radioactive concentrate (when necessary) by evaporation;
- pH correction;
- dosing of the liquid radioactive concentrate, the cement and the additives;
- mixing, homogenisation and filling of the cement radioactive mixture into reinforced concrete container;
- placing cover, sealing the package with non-radioactive cement top.

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

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

There are three separate processing lines in RAWPP:

2.1.1.1. Line "Solid RAW"

It is designed for sorting and treatment by compaction of solid RAW in order to reduce the volume and to prepare them for further conditioning. The line includes:

- Centre for receiving and uploading of solid RAW;
- Sorting table;
- Two 50 t in-drum compactors;
- Mechanism for sealing of 210 litres drums;
- System for measuring of wastes' activity;
- 910 t super-compactor;
- Two drum depots;
- Roll-a-way conveyors;
- Crane-manipulator;
- 20 t transport carriage;
- Two cranes with load capacity of 40 t.

2.1.1.2. Line "Liquid RAW"

It is designed for treatment and conditioning of liquid RAW – separate or together with solid RAW and consists of: a:

- Specialised tank truck for transport of the liquid RAW from the KNPP tanks for liquid radioactive concentrate;

- Section for receiving and unloading of liquid RAW;
- Two 40 m^3 receiving tanks for liquid RAW;
- Two-stages evaporator with tanks for distillate and condensate received;
- Two 12 m^3 tanks for concentrated liquid RAW ;
- Receiving silos for cement and chemical additives;
- Feeders and batcher for cement and additives;
- Mixer;
- Pumps, tanks, etc.

2.1.1.3 Installation for decontamination

It is designed for decontamination of radioactive metal RAW and includes:

- Compartment for receiving and fragmentation of waste;
- Alkaline treatment module;
- Acid treatment module;
- Electrochemical treatment module
- Module for final control of radioactive contamination;
- Radiation monitoring systems, ventilation, sewerage and neutralization of solutions;
- Tanks, transport and lifting equipment;

RAWPP is provided with all necessary auxiliary systems.

2.1.2. Storage facility for conditioned RAW

It is designed for temporary storage (prior to disposal) of conditioned RAW from Kozloduy NPP.

It is a surface reinforced concrete facility which provides the necessary engineering barriers between the stored RAW and the personnel and the environment. Its capacity is 1920 RAW packages - reinforced concrete containers with conditioned RAW (960 in both sectors "A" and "B", in 4 rows one on top of the other). Two bridge cranes of 25 t load capacity each (one for each sector) perform all transport operations in the storage facility. They are provided with grip devices for arranging and positioning of the containers with RAW.

2.1.3. Site "Lime Plant"

A site where the following sub-sites for RAW management are separated:

2.1.3.1. Trench Storage facility

It is designed for temporary storage of unprocessed and processed solid RAW of class 2-I and 2-II and serves all nuclear facilities at the Kozloduy NPP site.

The storage facility represents a surface reinforced concrete construction of vault-type. It is divided on forty cells with upper hatch, with dimensions 2.7 x 5.9 x 6.0 m each and volume 96.5m^3. Operating conditions – ambient temperature, atmospheric pressure.

2.1.3.2. Storage facility for processed solid RAW

It is designed for temporary storage of processed solid RAW 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 RAW are stored in metal pallets, arranged in three rows in height. The capacity of the facility is 1130 m^3. Operating conditions – ambient temperature, atmospheric pressure

2.1.3.3. Sites (№1 u №2) for storage of solid RAW in reinforced concrete containers

It is designed as buffer storage of processed solid RAW of class2-I and 2-II, packaged in reinforced concrete containers. It serves all nuclear facilities at the Kozloduy NPP site. The capacity for placing is about 2000 RAW packages.

The reinforced concrete container is licensed for transport and storage of solid RAW class 2a. It is with overall dimensions 1.95 x 1.95 x 1.95 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 waste form is in accordance with Design modification No. RAW TR-02/11.07.01.

2.1.3.4. Site for storage of solid RAW in freight containers

It is designed for buffer storage of low-active solid RAW class 2-I. It serves all nuclear facilities at the Kozloduy NPP site. The site is with capacity for placing of 14 containers.

The freight ISO- standard container with side door is with overall dimensions 5.8 x 2.2 x 2.4 m and net volume of 30 m^3. Operating conditions – ambient temperature, atmospheric pressure.

2.1.3.5. Storage facility for contaminated soil

This facility is located at **"Lime Plant" Site.** It is designed for storage of soil construction and other bulk technological waste with very low level of contamination. Storage capacity is approximately 8000 m^3. This facility is in process of reconstruction.

2.2 RAW –Novi Han SD

Novi han storage site is located 35 km south-east from Sofia and 6.5 km from the village of Novi han in the Lozen mountain. It has been designed for storage of conditioned and non-conditioned RAW from the nuclear applications from various branches of industry, medicine, agriculture and science and consists of:

2.2.1. Storage facility for solid RAW

For storage of non-conditioned solid low and intermediate level short-lived RAW (2a class). The capacity is 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 external insulation layer is additionally protected by bricks 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 could be grouted with concrete.

2.2.2. Storage facility for biological RAW

For storage of conditioned by stabilization in the gypsum matrix of pre-treated with formaldehyde biological RAW, low and intermediate level short-lived class 2a. The capacity of the storage facility is 80 m^3. Its construction is similar 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 over ground part (roof construction). The facility is accessible from the surface through 8 hatches with dimensions 80 x 80 cm.

2.2.3. Storage facility for spent sealed sources

For storage of non-conditioned low and intermediate level sealed sources class 2a. 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 50 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.

2.2.4. Engineering trench for solid RAW

For non-conditioned solid low and intermediate level short lived solid waste class 2a. 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 filled, stabilised with cement grout, and covered with temporary protective coating.

2.2.5. Storage for liquid RAW

For storage of unprocessed low and intermediate level liquid RAW class 1 and 2a. 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.

2.2.6. Site No. 1 and 1A for storage of solid RAW

For of solid wastes class 2a and 2b stored in freight ISO- standard containers. Fire alarm detectors in transport packages, solid RAW and β,γ-spent 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 containers are with dimensions 6.00 x 2.35 x 2.4 m. The site capacity is 14 containers with 462 m^3 total volume.

2.2.7. Site No. 2 for storage of solid RAW

For storage of solid RAW class 2a and 2b in concrete containers different type. On the site are stored spent sources in their transport packages in concrete receivers "PEK" type, sealed sources in reinforced concrete containers StBKKUB and not completely discharged gamma-irradiators 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.

2.2.8. Site No. 4 for storage of low active RAW

RAW on this site are stored either in 200-liters drums or in euro-pallets. The site capacity is 400 drums, respectively 100 pallets.

2.2.9. Complex for processing of RAW

For characterization and processing of solid waste category 1, 2a and 2b and liquid radioactive solutions. Consits of following systems and equipment:

- System for treatment of liquid radioactive waste;
- Cementation unit for liquid and solid waste;
- In-drum compaction system for solid RAW (200 l drums);
- RAW decontamination system;
- Compartments for sorting, fragmentation and pre-treatment of solid waste;

- Buffer storage places;
- Auxilary systems .

2.3. Decommissiong-Kozloduy SD

By decision of the Council of Ministers 839 of December 20, 2008, Units 1 and 2 of NPP, "Kozloduy", which operation is terminated, are declared as facilities for radioactive waste management and transferred to the State enterprise "Radioactive Waste". The SE RAW has received a licence by the NRA for operating of unit 1 and 2 of the NPP "Kozloduy" as facilities for RAW management, that are forseen for decommissioning.

Activities of handling, storage, processing and transportation of "historical" and secondary waste, until their transfer to the SE RAW KNPP, take place within the facility.

Information for the facilities for waste management is presented in section 1.1 and 1.4 of Annex L-3.

3. INRNE – BAS FACILITIES FOR RAW MANAGEMENT

3.1. Storage for reactor equipment

The storage is for the operational low level solid RAW, category 2 constructed from reinforced concrete as a separate building with size- 20x10 m at the site of the RESEARCH REACTOR IRT-2000. The capacity is in compliance with the term of operation of IRT-2000.

3.2. Site for storage of solid RAW in reinforced concrete containers

For storage of treated solid RAW, category 2 from the reactor partial dismantling. RCC are used for the packaging of RAW. The site is located nearby the storage for reactor equipment as a concrete spot with size 16.7 x 6.5 m. A temporary tin roof is erected over the RAW packages. The capacity is 14 RAW packages.

4. FACILITIES FOR RAW MANAGEMENT OF THE CLOSED URANIUM MINING

4.1. 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 compacted and partially re-cultivated.

4.2. 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 RAW from the decommissioning of “Metalurg” plant are stored in trenches close to the tailings pond’s. The facilities, which have served the tailings pond activity, are not in operation. An automated pump station for infiltrated water is built..

*4.3. 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 23.1 hectares. A decontamination plant for the drain water is constructed.

4.4. Facility for sorption treatment of uranium contaminated mine water at the "Chora" sector

It is located near the town of "Buchovo", for treatment of uranium contaminated mine water. The main parameters of the treated water are: flow 800 м^3 to 2100 м^3 per day and uranium content up to 1.9 mg/l. The facility consists of the following equipment:

- two pump stations for mine water
- pressure reservoir with dimensions 10 x 39 x 2.5 m;
- two sorption columns of 25 m^3 volume each;

4.5. Facility for sorption treatment of uranium contaminated mine water at the "Bialata voda" sector

Located 30 km west of town of Dolna Bania, it is for treatment of uranium contaminated mine water. The average quantity of the gravitational receiving water for treatment is 500 m^3/24 hours period.

The facility consists of the following main equipment:

- barrage under waste heaps;
- receiving basin (sedimentation tank)
- sorption column with inner volume of 28 m^3.

4.6. Facility for sorption treatment of uranium contaminated mine water at the "Iskra" sector

It is located 10 km north-west of town of Novi Iskar. The receiving water is about 20 m^3 per 24 hour period and content of uranium 1.0 mg/l.

The main equipment is the following:

- a sorption column with volume 2.0 m^3;
- reinforced concrete reservoir for water neutralisation with lime;
- receiving tank;

4.7. Line for regeneration of ion-exchange resins.

An integral part of the technology for mine water sorption treatment is the line for regeneration of uranium saturated 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 capacity of he line is 0.5 m3/h regenerated resin.

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. .
- regeneration of the sorbent with 110g/l H_2SO_4 solution;
- water extraction of uranium from the regenerating solution;
- re-extraction of the uranium and processing of the solution to produce solid $NH_4UO_2(CO_3)_3$.;

RADIOACTIVE WASTE INVENTORY

1. Kozloduy NPP Plc.

1.1.AB-1

1.1.1.Solid RAW – class 2-I and 2-II
RAW volume towards 31.12.1010 - 300 m^3
Physical components (vol. **%**) –metal (22%), wood (2%), polymers (20%), wadding (0%), mixed (56%).

Processing

	Processed Waste (vol. %)	Volume Reduction Factor
Pre-compaction		-
Super-compaction		-
Packing		-
Not treated	100	-

1.1.2.Liquid RAW
Liquid radioactive concentrate - class 2-C
RAW volume at 31.12.2010 – 2000 m^3

General description - Liquid radioactive concentrates with total salts content 28-35 %, boron acid concentration up to 4 %, pH 7 –9 in different tanks. Presence of precipitated solid phase, mainly sodium borates and sludges.
Radionuclide inventory: ^{134}Cs, ^{137}Cs,^{60}Co, ^{54}Mn, ^{58}Co and ^{110m}Ag are detected in the liquid phase. In the most of cases the first three of isotopes are detected, and for the rest of them the specific activities are under the detection limits for the conditions of the measurement. The registered activity is in the range: ^{134}Cs - $5.10^4 \div 10^6$ Bq/dm^3, ^{137}Cs- $1.10^6 \div 4.10^7$ Bq/dm^3, ^{60}Co- $3.10^4 \div -1.10^6$ Bq/dm^3.

1.1.3.Spent sorbents - class 2-C
RAW volume at 31.12.10 – 368 m^3 (БВС – 135 m^3; БНС – 233 m^3)
General description – Spent organic and non-organic sorbents. The radioactivity levels vary considerably depending on the sorbents proportion in the particular sources. The sorbents are accumulated under water in tanks. They are homogeneously distributed in the volume and can be easily transported.
Physicochemical characteristics are similar to those of the initial sorbents, used durring the operational period of the units. Proportion – about 70% vol. sorbent and about 30% vol. water.
Radionuclide inventory: Spent sorbents in БНС: ^{134}Cs - $1.10^5 \div 9.10^5$ Bq/kg, ^{137}Cs- $6.10^6 \div 3.10^7$ Bq/kg, and ^{60}Co - $1.10^5 \div 5.10^6$ Bq/kg.
The radionuclide inventory in БВС includes the same nuclides with activity : ^{134}Cs - $5.10^5 \div 3.10^6$ Bq/kg, ^{137}Cs- $6.10^6 \div 6.10^7$ Bq/kg, ^{60}Co - $5.10^6 \div 8.10^6$ Bq/kg.
An investigation for evaluation of difficult to measure nuclides is forthcoming.

1.2. AB-2

1.2.1 Solid RAW - class 2-I and 2-II.
RAW volume at 31.12.1010 – 219.7 m^3

Physical components (vol. %) – textile (4%), metal (1%), filings (1%), wood (4%), polymers (42%), wadding (1%), mixed (47%).

Processing

Processed wasted - 1313 drums (200 l)

	Processed Waste (vol. %)	Volume Reduction Factor
Pre-compaction		-
Super-compaction	54,5	7
Packing		-
Not treated	45,5	-

1.2.2. Liquid RAW

Liquid radioactive concentrate - class 2-C.

RAW volume at 31.12.2010 - 1900 m^3

General description - Liquid radioactive concentrates with total salts content 28-35 %, boron acid concentration up to 5.5 %, pH 7 –9 for the particular tanks. Presence of precipitated solid phase, mainly sodium borates and sludges.

Radionuclides inventory: ^{134}Cs, ^{137}Cs, ^{60}Co, ^{54}Mn, ^{58}Co and ^{110m}Ag are detected in the liquid phase. In the most of cases the first three of isotopes are detected, and for the rest of them the specific activities are under the detection limits for the conditions of the measurement. The registered activity is in the intervals: ^{134}Cs - $1.10^4 \div 2.10^6$ Bq/dm^3, ^{137}Cs- $6.10^6 \div 4.10^7$ Bq/dm^3, ^{60}Co-$6.10^4 \div 1.10^6$ Bq/dm^3.

1.2.3.Spent sorbents - class **2-C.**

RAW volumes at 31.12.2010 - 238 m^3 (БВС – 108 m^3; БНС – 130 m^3)

General description – Spent organic and non-organic sorbents. The radioactivity levels vary considerably depending of the sorbents proportion in the particular sources. The sorbents are accumulated under water in tanks. They are homogeneously distributed in the volume and can be easily transported.

Physicochemical characteristics are similar to those of the initial sorbents, used durring the operational period of the units.Proportion – about 70% vol. sorbent and about 30% vol. water.

Radionuclides inventory: Spent sorbents in БНС: ^{134}Cs - $4.10^5 \div 6.10^5$ Bq/kg, ^{137}Cs- $6.10^6 \div 4.10^7$ Bq/kg, and ^{60}Co - $3.10^5 \div 9.10^6$Bq/kg. The spent sorbents in БНС are: ^{134}Cs - 4.10^5-6.10^5 Bq/kg, ^{137}Cs- 6.10^5- 4.10^7 Bq/kg, and ^{60}Co - 3.10^5 - 9.10^6 Bq/kg.

The radionuclide inventory in БВС includes the same nuclides with activity: ^{134}Cs - $4.10^5 \div 3.10^6$ Bq/kg, ^{137}Cs- $6.10^6 \div 1.10^7$ Bq/kg, ^{60}Co - $2.10^6 \div 7.10^6$ Bq/kg.

An investigation for evaluation of difficult to measure nuclides is forthcoming.

1.3.AB-3

1.3.1 Solid RAW – class 2-I and 2-II

RAW volume at 31.12.10 – 764.4 m^3

Physical components (vol. %): metal (22%), wood (2%), polymers (20%), mixed (56%)

Processing

Processed wasted - 3649 drums (200 l)

	Processed Waste (vol. %)	Volume Reduction Factor
Pre-compaction	100	3
Super-compaction		
Packing		
Not treated		

Radionuclide inventory [Bq/kg]:– ^{134}Cs–2.10^4, ^{58}Co – 2.10^4, ^{137}Cs – 6.10^4, ^{60}Co – 2.10^5

1.3.2. Solid RAW – class 2-III
RAW volume at 31.12.2010 – 16. 7m**3**
Physical components – mainly metal RAW.

1.3.3.Liquid RAW
Liquid radioactive concentrate - class 2-C
RAW volume at 31.12.10 - 2045 m^3
General description – Liquid radioactive concentrates with total salts content 80÷355 g/l, boron acid concentration 17÷63 g/l, pH 8÷12 for the particular tanks. Presence of precipitated solid phase, , mainly sodium borates and sludges
Radionuclides inventory: ^{134}Cs – 2.10^5÷2.10^6 Bq/dm^3, ^{137}Cs – 2.10^5÷1.10^7 Bq/dm^3, ^{60}Co – 1.10^4÷4.10^4 Bq/dm^3
1.3.4.Spent sorbents - class **2-C**
RAW volume at 31.12.10 - 134 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. Physicochemical characteristics are similar to those of the initial sorbents, used durring the operational period of the units.There is presence of small amounts of activated carbon. Proportion – about 70% vol. sorbent and about 30% vol. water.
Radionuclides inventory: ^{134}Cs – 2.10^4÷1.10^7 Bq/dm^3, ^{137}Cs – 6.10^4÷4.10^7 Bq/dm^3
^{60}Co – 1.10^6÷2.10^6 Bq/dm^3 , ^{54}Mn– 2.10^5÷5.10^5 Bq/dm^3

1.4. Storage facility in Reactor Hall – 1 (RH-1)
Solid RAW - class 2-III
RAW volume at 31.12.2010 – 52 m^3

1.5. Storage facility in Reactor Hall – 2 (RH-2)
Solid RAW - class 2-III
RAW volume at 31.12.2010 – 32 m^3

2. <u>SERAW,</u>
2.1 <u>RAW KOZLODUY SD</u>
2.1.1 Storage facility for conditioned RAW
Solid RAW - class 2a **Number of RAW packages ,** stored at 31.12.2010

RAW Packages, Type	***Number of packages***
RCC-1	296
RCC-3	739
Total	1 035

Radionuclide content of the conditioned RAW, [Bq/kg]:

RCC-1		RCC-3	
^{54}Mn – 2.10^2	^{137}Cs – 4.10^4	^{54}Mn – 7.10^3	^{110m}Ag – 1.10^4
^{60}Co – 5.10^4		^{59}Fe – 6.10^2	^{134}Cs – 1.10^6
^{110m}Ag – 3.10^2		^{57}Co – 4.10^3	^{137}Cs – 2.10^7
^{134}Cs – 4.10^3		^{60}Co – 3.10^5	^{95}Nb – 4.10^1

2.1.2 Trench storage facility
Solid RAW - class **2**a, additional categories 2-I and 2-II
RAW Volume at 31.12.2010 - 2744 m^3
Physical components (volume %) of not treated RAW - textile (23.3%), metal (8.8%), wood (2.4%), construction rubbles (6.9%), polymers (2%), wadding (5.7%), rubber (0.2%), mixed (50.8%).

Processing

Processed wasted- 12857 drums (200 l)

	Processed waste (volume %)	Volume Reduction Factor
Compaction		
Super-compaction	43	7
Packing		
Not-treated	57	-

Radionuclide content of the processed RAW, [Bq/kg]:

$^{54}Mn – 1.10^3$	$^{110m}Ag – 5.10^2$
$^{59}Fe – 9.10^1$	$^{134}Cs – 2.10^3$
$^{58}Co – 6.10^2$	$^{137}Cs – 5.10^4$
$^{60}Co – 5.10^4$	$^{95}Nb – 4.10^2$

2.1.3 Storage facility for processed solid RAW
Solid RAW - class 2-I and 2-II
RAW Volume till 31.12.2010 - 374 m^3
Physical components (volume %)- textile (8%), metal (29%), construction rubbles (20%), wadding (14%), mixed (29%).

Processing

	Processed waste (volume %)	Volume Reduction Factor
Compaction		
Super-compaction	100	7
Packing		
Not-treated	-	-

2.1.4 Sites (№1 и №2) for storage of solid RAW in reinforced concrete containers
Solid RAW - class **2**a
Number of RAW packages , stored at 31.12.2010 – RCC-2 – 272.
Physical components (volume %) - 200-l drums with solid RAW, super compacted and immobilized in non-radioactive concrete matrix.
Radionuclides inventory of the conditioned RAW, [Bq]:

$^{54}Mn – 2.10^9$	$^{134}Cs – 3.10^9$
$^{60}Co – 6.10^{10}$	$^{137}Cs – 5.10^{10}$
$^{110m}Ag – 3.10^8$	

2.1.5 Site for storage of solid RAW in freight containers
Solid RAW - class **2-I**
RAW volume at 31.12.10 - 180 m^3
Physical components (vol. %) – metal (38%), construction rubbles (62%).

Processing
Processed wasted- 577 drums (200 l)

	Processed Wastes (vol. %)	Volume Reduction Factor
Pre-compaction	60	3
Super-compaction		
Packing		
Not treated	40	-

Radionuclide content of the processed RAW [Bq/kg]:

$^{54}Mn – 9.10^2$	$^{134}Cs – 5.10^3$
$^{60}Co – 2.10^4$	$^{137}Cs – 1.10^4$

2.2 RAW-Novi Han SD
2.2.1 .Storage facility for solid RAW
Volume of stored RAW at 31.12.2010 - 80 m^3

Radionuclide	**Activity,** Bq
H-3	1,4 E +11
C-14	3,7 E +11
Co-60	2,6 E +11
Sr-90	6,2 E +11
Cs-137	3,5 E +11
Total activity:	4,9 E +12

2.2.2 Storage facility for biological RAW
Volume of the stored RAW at 31.12.2010 - 64 m^3

Radionuclide	**Activity,** Bq
H-3	6,1 E +09
C-14	1,5 E +10
Co-60	2,5 E +09
Sr-90	1,5 E +10
Cs-137	9,1 E +10
Total activity	1,3 E +11

2.2.3. Storage facility for spent sealed sources
Volume of the stored RAW at 31.12.2010 - 0,65 m^3

Radionuclide	**Activity,** Bq
Co-60	2,1 E +12
Sr-90	5,3 E +10
Cs-137	4,4 E +13
Ra-226	6,0 E +11
Pu-239	1,8 E +11
Total activity	4,7 E +13

2.2.4 **Engineering trench for solid RAW**

Volume of the stored RAW at 31.12.2010 PAO - 160 m^3

Radionuclide	**Activity ,** Bq
Co-60	5,5 E +10
Sr-90	1,2 E +11
Cs-137	5,7 E +11
Total activity	7,4 E +11

The radionuclide inventory also includes H-3, Na-22, Fe-55, Ni-63, Kr-85, Ba-133, Tl-204, Am-241, the sum of which activities represents 1,7% of the total activity.

2.2.5 ***Storage for liquid RAW***

Volume of the stored RAW at 1.12.2010 - 48 m^3

Радионуклид	**Activity ,** Bq/l Tank №1	**Activity ,** Bq/l Tank №2	**Activity ,** Bq/l Tank №3	**Activity** , Bq/l Tank №4
Co-60	290,0	3,6	0,7	0,4
Cs-137	5086,0	112,5	27,0	8,8
Sr-90	1720,4	19,2	46,6	19,2
H-3	1236	1189	25369	6725
Alpha emitters	12,6	13,1	12,6	13,3
Total activity	8345	1337	25456	6767

2.2.6 Site No. 1 and 1A for storage of solid RAW

Radionuclide content of stored RAW at 31.12.2010

Radionuclide	**Activity ,** Bq
Am-241	3,4 E +11
Am-Be	4,3 E +10
C-14	3,1 E +09
Cl-36	4,6 E +09
Cm-244	6,8 E +09
Co-57	9,6 E +08
Co-60	5,5 E +12
Cs-137	2,1 E +10
Kr-85	4,0 E +11
Pu*	2,5 E +12
Pu-239	4,7 E +10
Sr-90	1,5 E +11
Total activity	9,0 E +12

2.2.7 Site №2 for storage of solidRAW

Radionuclide content of stored RAW at 31.12.2010

Radionuclide	**Activity ,** Bq
Am-241	1,4 E +12
C-14	8,8 E +10
Co-60	6,0 E +14
Cs-137	4,2 E +14
Kr-85	3,9 E +11
Pu-Be	1,8 E +11
Pu*	7,7 E +10
Sr-90	1,2 E +11
Total activity	1,0 E +15

2.2.8 Site No. 4 for storage of low active RAW

Volume of the stored RAW at 31.12.2010 - 76 m^3

Radionuclide	**Activity ,** Bq
Am-Be	1,3 E +12
Cm-244	9,1 E +09
Co-60	1,7 E +12
Cs-137	2,6 E +12
Fe-55	2,0 E +09
H-3	3,0 E +09
Kr-85	4,1 E +10
Pu*	1,1 E +11
Sr-90	2,1 E +09
Pu -Be	2,4 E +11
Ra-226	3,9 E +10
Total activity	6,1 E +12

3. INRNE - BAS

3.1 Storage for reactor equipment

Solid RAW – Category **2a**

RAW amount at 31.12.2010 – two heat exchangers and 5 mechanical and ion filters from the first cycle of the reactor IRT.

Physical components (volume %) – mainly metal RAW, generated during partial dismantling of IRT -2000, contaminated staff- protective equipment, materials from the maintenance works.

Processing

Performed processing – partial sorting in 6 drums (200 1)

3.2 Site for storage of solid RAW in reinforced concrete containers

Solid RAW - category **2a**

RAW amount at 31.12.2010 – 9850 kg.

Physical components (volume %) – mainly metal RAW, generated during partial dismantling of IRT-2000 – steel, aluminum, iron, small amount of graphite, concrete, rubber and plastics.

Processing

Performed processing – packaging in 6 containers type RCC (5 $м^3$ each)

Radionuclide content – mainly Co-60, C-14, Eu-152.

4. Uranium mining

Tailings pond "Buchovo – 1"

Quantity of disposed waste: 1.3 millions m^3 tailings.

Tailings pond "Buchovo – 2"

Quantity of disposed waste: 4.5 million tons tailings and unspecified quantity of solid RAW from the liquidation of "Metalurg" uranium milling plant.

Tailings pond Eleshnitsa

Quantity of of disposed waste: 9.0 millions tons tailings, 7.680 million tones solid RAW, 1700 m^3 spent ion-exchange resin and unspecified quantity of solid RAW from the liquidation of "Zvezda" uranium milling plant;

Estimated activity: $1{,}5.10^{15}$ 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

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. Treaty on the Non-Proliferation of Nuclear Weapons

1.8. Agreement Between the Kingdom of Belgium, the Kingdom of Denmark, the Federal Republic of Germany, Ireland, the Italian Republic, the Grand Duchy of Luxembourg, the Kingdom of the Netherlands, the European Atomic Energy Community and the International Atomic Energy Agency in Implementation of Article III, (1) and (4) of the Treaty on the Non-Proliferation of Nuclear Weapons (78/164/EURATOM; INFCIRC 193 IAEA) into force for the Republic of Bulgaria as of 1st of may 2009;

1.9. Protocol Additional to the Agreement between the Republic of Austria, the Kingdom of Belgium, the Kingdom of Denmark, the Republic of Finland, the Federal Republic of Germany, the Hellenic Republic, Ireland, the Italian Republic, the Grand Duchy of Luxembourg, the Kingdom of the Netherlands, the Portuguese Republic, the Kingdom of Spain, the Kingdom of Sweden, the European Atomic Energy Community and the International Atomic Energy Agency in implementation of Article III, (1) and (4) of the Treaty on the Non-Proliferation of Nuclear Weapons (1999/188 EURATOM; INFCIRC 193 add.8 IAEA), into force for the Republic of Bulgaria as of 1st of may 2009;

1.10. AGREEMENT between the Government of the Republic of Bulgaria and the Government of the Republic of Greece on early notification in case of nuclear accident and exchange of information for nuclear facilities, 23 April 1989;

1.11. AGREEMENT between the Committee on the Use of Atomic Energy for Peaceful Purposes of the Republic of Bulgaria and the Commission on Atomic Energy of the Republic of Greece on Early Notification of Nuclear Accident and Exchange of Information for Nuclear Facilities, 15 February 1991;

1.12. AGREEMENT between the Government of the Republic of Bulgaria and the Government of the Republic of Romania on Early notification in case of nuclear accident and exchange of information for nuclear facilities;

1.13. AGREEMENT between the Government of the Republic of Bulgaria and the Government of the Republic of Turkey on Early notification in case of nuclear accident and exchange of information for nuclear facilities;

1.14. 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;

1.15. 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;

1.16. 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;

1.17. AGREEMENT between the Government of the Republic of Bulgaria and the Government of the Russian Federation in the domain of atomic energy sector;

1.18. 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.

1.19. AGREEMENT between the Government of the Republic of Bulgaria and the Government of the Ukraine on Early Notification in Case of Nuclear Accident and Cooperation in Nuclear Safety and Radiation Protection Area, into force as of 11th of September 2003

1.20. AGREEMENT between the Nuclear Regulatory Agency (Republic Of Bulgaria) and the Radiation Safety Directorate (Republic Of Macedonia) For Cooperation in Radiation Protection Matters, into force as of 17th of November 2010

1.21. AGREEMENT between the Government of the Republic of Bulgaria, the Government of the Russian Federation and the Government of the Ukraine on transport of nuclear material between the Russian Federation and the Republic of Bulgaria through the territory of Ukraine, into force as of 8th of September 2006

1.22. AGREEMENT between the Government of the Republic of Bulgaria, the Government of the Republic of Moldova, the Government of the Russian Federation and the Government of the Ukraine on cooperation in transportation of nuclear material between the Russian Federation and the Republic of Bulgaria through the territory of Ukraine and Moldova, into force as of 16th of April 2006

1.23. AGREEMENT between the Committee on the Use of Atomic Energy for Peaceful Purposes and the Ministry of Economy of the Slovak Republic on cooperation in regulatory safety matters, done on 29th of September 1999

1.24. AGREEMENT between the Government of the Republic of Bulgaria and the Government of the United States of America for cooperation in the field of peaceful uses on nuclear energy, done in June 1994

2. Acts

2.1. Act on the Safe Use of Nuclear Energy

2.2. Act on Environmental Protection

2.3. Health Act

2.4. Disaster Protection Act

3. Secondary Legislation

3.1. Regulation for the basic norms for radiation protection

3.2. Regulation for providing the safety of spent nuclear fuel management

3.3. Regulation for safety of radioactive waste management

3.4. Regulation for safety of the decommissioning of nuclear facilities

3.5. Regulation for the conditions and procedure for transfer of radioactive waste to the state enterprise "Radioactive Waste"

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.

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.

3.8. Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy

3.9. Regulation for radiation protection during activities with sources of ionizing radiation

3.10. Regulation for providing the safety of nuclear power plants

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

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

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

3.14. Regulation for emergency planning and emergency preparedness in case of nuclear and radiological accident

3.15. Regulation for providing of the physical protection of nuclear facilities, nuclear material and radioactive substances

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

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

3.18. Regulation on providing the safety of research nuclear installations

3.19. Regulation on the conditions and procedure for transportation of radioactive substances

3.20. Regulation on Safety and Radiation protection Requirements related to Liquidation the Results from Uranium Ore Industry

3.21. Regulation on the conditions and procedure for implementation of environmental impact assessment of investment proposals for construction, activities and technologies

3.22. Rules of Procedure of the NRA

3.23. Regulation for the procedure for paying the fees ensuing by the Safe Use of Nuclear Energy Act.

3.24. Tariff for the fees collected by the NRA in accordance with the provisions of the Safe Use of Nuclear Energy Act

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

Human and financial resources for management of SF and RAW

I. Human Resources

Pursuant to the safety requirements of the ASUNE, the management of radioactive waste and spent fuel is carried out only after obtaining permission and/or a license by the Nuclear Regulatory Agency.

The licensees carry out the full responsibility for ensuring the safety of facilities and activities. The responsibilities of the organizational units and officials in the Kozloduy NPP during operation of nuclear facilities are clearly allocated and documented.

In fulfillment of these requirements pursuant to the ASUNE, the licensees have an established and operating system for selection and training of staff.

To ensure that the staff is qualified and competent, a system for selection is applied that requires the following, namely:

- Checking the health status and permission to work in an environment of ionizing radiation, which is done by their own occupational health service;

- Conducting psychophysiological examination for correspondence of the personal qualities of the candidates for operative personnel working with radioactive waste and spent fuel with the necessary requirements for the job position and a subsequent issuing of a conclusion. This examination is performed by qualified psychologists and the Ministry of Health provides methodological guidance to this process.

- Conducting professional selection – checking of the compliance of the applicants with the requirements of the job description with regard to the level of education, acquired specialty, ensuring an acquired minimum of knowledge and the required working experience.

The job descriptions are prepared in accordance with the requirements of the *Regulation on the conditions and order for acquiring professional qualifications and the order for issuing licenses for specialized training and certificates of competency for the use of nuclear energy* and include the functions related to the safe operation of nuclear facilities, the necessary minimum of knowledge in the field of utilization of nuclear energy, nuclear safety and radiation protection and the necessary certification.

For the purpose of carrying out specialized training and maintaining the staff qualification, Kozloduy NPP has its own training center and has a license for specialized training.

The activities on management of RAW and SF are ensured with a sufficient in number and qualified personnel. The specific job positions, the number and the required minimum educational degree for holding the position are determined in the established job description panels of the licensees.

As of 1 November 2010 the staff of Units 1 and 2 of the Kozloduy NPP were transferred to SE RAW .

As of 1 July 2011 a change has been made in the structure and the job positions panel of Units 3 and 4 of Kozloduy NPP, as the positions have been aligned with the activities during the transition period from operation in mode “E” to decommissioning of the nuclear facilities. The new structure provides the necessary personnel for preparation and control of decommissioning

activities at units 3 and 4, and management of radioactive and non-radioactive materials and waste.

In 2011 the Kozloduy NPP within the project "Improving the safety culture" (KNPP1) within the Programme for excellence in the framework of the Programme for Cooperation Norway - Bulgaria "Safe nuclear energy" carried out a self-assessment of the safety culture of the staff in the Kozloduy NPP using the following methods: document review, observation of work processes and meetings, interviews, polls and forming focus groups. An analysis was prepared of the causes for the existence of areas for improvement and proposed improvement measures for each of the existing areas.

II. Financial resources in the management of SF and RAW

Kozloduy NPP

The activities on management of SF, RAW and decommissioning of nuclear facilities and the ensuring and maintaining of safety in the facilities for management of SF and RAW are funded by various sources as follows:

Own resources

The expenses made by the Kozloduy NPP on SF management, for its storage, transportation and technological processing in Russia, are deductible in determining the price of electricity as stipulated by the sectoral regulator - the State Energy and Water Regulatory Commission. Accordingly, these expenses are financed with own funds - revenue from the sale of electricity.

The unused funds recognized in the price formation for the current are put into savings. The management of these funds is as follows: they are entered into a special account opened by the Kozloduy NPP in a bank under terms approved by the MEET. The accumulated funds in the account shall be used only to cover expenses related to transportation, technological storage and processing of SF, that have remained non completed from previous years.

Fund "RAW" and fund "DNF"

The order for collecting and spending of financial resources in the funds is determined in the *Regulation on the order for establishment, collecting, spending and control of funds and on the amount of contributions to fund "RAW"* and the *Regulation on the order for establishment, collecting, spending and control of funds and on the amount of contributions to fund "DNF"*.

Following the presentation of the third national report, no changes have been made in the methodology for determining the amount of monthly installments which the Kozloduy NPP has to pay to the two funds. For the period from January 1, 2008 to June 30, 2011, the contributions of the Kozloduy NPP to the funds, as well as the expenditure made by them are as follows:

Fund "RAW" - collected/spent by the Kozloduy NPP, Bulgarian leva		
year	collected	spent
2008	22 008 699	0
2009	22 326 047	0
2010	22 164 424	0
by 30.06.2011	12 481 900	0
Total:	78 981 070	0

Fund "DNF" - collected / spent by the Kozloduy NPP, Bulgarian leva		
year	collected	spent
2008	56 801 506	2 152 171
2009	85 842 654	31 063 999
2010	66 571 599	2 927 290
By 30.06.2011	31 204 750	250 000
Total:	240 420 509	36 393 460

International Fund Kozloduy

With funds from the International Fund "Kozloduy" is funded or co-financed the preparation and implementation of projects on decommissioning of units 1-4 of Kozloduy NPP. Following the presentation of the third national report, no changes in the structure and rules of operation of the International Fund Kozloduy have been made. For the period from January 1, 2008 to June 30, 2011 the expenditure made by the Kozloduy NPP, funded by the International Fund Kozloduy, are as follows:

Expenditure made by the Kozloduy NPP, funded by the International Fund Kozloduy According to accounting data in Bulgarian leva					
Year	2008	2009	2010	Up to 30.06.2011	Total
sum	49 040 763	78 113 949	107 679 030	24 909 481	259 743 224

SE RAW

Cost of financing (including from other sources) of the activities on management of RAW and on the preparation for decommissioning of nuclear facilities as per years until 31.12.2010

year	From fund RAW	Other financing (PHARE, EBRD, IAEA)
2008	16 922 502	2 751 643
2009	19 361 252	9 407 854
2010	19 108 172	235 863

Annex L-7

Preparation for decommissioning of shut down nuclear facilities in the Kozloduy NPP

Development of the activities following the Third National Report

1. Changes in the concept of decommissioning occurred in the period 2008 – 2011.

As adopted in 2011 in the National Strategy for the management of spent nuclear fuel and radioactive waste, the concept of "permanent dismantling" of KozloduyNPP Units 1 and 2 has been envisaged until the year 2030, reaching an end state of "brown field" on the site where decommissioning of units 1 to 4 of KozloduyNPP is taking place. To achieve this purpose, dismantling of the equipment not intended for further use is planned, as well as release of buildings and facilities, processing and transfer of all radioactive waste from the site and bringing the site to a condition suitable for the needs of nuclear power or other economic activities.

2. Plans and schedules for decommissioning.

Following the carried out in 2010 review of the Updated strategy and revision of the Conceptual schedule for carrying out of the activities, the plans and schedules for carrying out of preparatory activities and for the activities on decommissioning of units 1-4 have been brought into concordance with the revised Conceptual schedule.

3. Key documents relating to decommissioning.

3.1.Plan for decommissioning of Kozloduy NPP Units 1 - 4

A new version has been prepared of the *Plan for decommissioning of Units 1 and 2 of Kozloduy NPP*, which reflected the recommendations of the Nuclear Regulatory Agency.

The plan for the decommissioning of units 3 and 4 of KozloduyNPP has been presented for review to the Nuclear Regulatory Agency in the month of December 2010

3.2. Report on safety assessment.

An updated report on the safety assessment for Stage 1 - Units 1 and 2 of KozloduyNPP has been prepared – Stage 1, Revision 3, Technical report on "Methodology for evaluation of exposure dose during activities on decommissioning" and "Evaluation of the source of radioactive contamination and exposure dose during dismantling in reactor hall".

In fulfillment of the transitional conditions of the licenses for operation of Units 1 and 2 of Kozloduy NPP, in 2010 has been carried out an assessment of the remaining lifetime of the systems, which remain in operation during decommissioning. A Safety Analysis Report has been prepared during decommissioning of units 3 and 4 of Kozloduy NPP – Stage 1, Revision 0A and a Technical Report on "Evaluation of the source of radioactive contamination and exposure dose during dismantling in reactor hall".

3.3 Environmental Impact Assessment (EIA) report.

The scope of the task has been made in accordance with the requirements of the Ministry of environment and water (MEW) and regulations on environmental protection.

In October 2010 the contractor Energiewerke Nord GmbH (EWN) has presented version 1 of the EIA report, including a non-technical summary and evaluation of the scale of impact on protected areas. At the end of May 2011, the Republic of Romania through the MEW has

supplied the necessary input data for the preparation of impact assessment in a transboundary aspect.

4. Costs estimate and financial ensuring of the decommissioning activities on units 1-4 of Kozloduy NPP.

According to the methodology developed by EDF and Framatom under a project funded by the EC in 2003, the estimated costs of decommissioning is approximately 710 million EUR. This amount is reflected in the Updated strategy for the decommissioning of Units 1 ÷ 4 of Kozloduy NPP. This assessment does not include costs for rehabilitation of the site, the construction of buffer storage facilities for very low active radioactive waste, decommissioning of facilities for processing and interim storage of radioactive waste and for repositories for interim storage of SF, the cost of processing and/or disposal of SF. This fact necessitated an updating of cost estimates for decommissioning.

For the updated cost estimates for decommissioning has been applied the approach WBS (Work Breakdown Structure), developed by IAEA and NEA/OECD.

In assessing the cost of decommissioning, the second version of the report "Human resources and financial aspects of decommissioning of Units 1 to 4 of Kozloduy NPP" dated 2006 has been taken into consideration.

The full costs of decommissioning for units 1-4 of Kozloduy NPP during the period 2003 - 2030, have been estimated at 1 542 million EUR.

The activities during the period of preparation for decommissioning of Units 1 to 4 have been financed by own funds of the Kozloduy NPP and from the state fund "Decommissioning of Nuclear Facilities" (DNF). After 2003, the financing of the preparatory activities for decommissioning has been assisted by the International Fund Kozloduy(KIDSF).

Collection and spending of financial resources in the fund "DNF" as per years

The collection and spending in the fund DNF are recorded, accounted for and spent in a centralized manner in the system in the unified budget account. The Fund is managed objectively in a way that ensures the implementation of the annual programme of the licensee operating the nuclear facility which is being decommissioned.

Financial resources in the fund DNF collected and spent by the Kozloduy NPP in Bulgarian leva

Year	Collected	Spent
2008	56 801 506	2 152 171
2009	85 842 654	31 063 999
2010	66 571 599	2 927 290
By 30.06.2011	31 204 750	250 000
Total:	240 420 509	36 393 460

International Fund Kozloduy

It has been established by the European Commission upon reached agreements with the Republic of Bulgaria and is intended for targeted financing or co-financing through subsidies of the preparation and implementation of selected projects to support the decommissioning of units 1-4 of the Kozloduy NPP, as well as for other projects in the energy sector.

By March 31, 2011 the Fund has accumulated 658 million EUR. Of these, 643 million are grants from the EU, the rest - from 10 European countries - donors. 35 Grant Agreements have been signed of a total value of 562 million EUR. The Kozloduy NPP has signed six agreements for grants to a total amount of 339 million EUR.

The total value of contracts signed under the agreements with the Kozloduy NPP is € 259,086,120.

The total paid sums on all contracts for which funding is from the KIDSF, is € 169 863 334 by 31 May 2011.

4.1 Abstract of part of the projects financed and co-financed by the International Fund Kozloduy. Status by 30 June 2011.

By 30 June 2011 the number of contracts is 54, the execution of 46 of them has been completed.

4.1.1. Project 1 - Design and construction of a storage facility for dry storage of spent nuclear fuel (DSFSF).

The design and construction of a dry spent fuel storage facility is implemented by the Consortium NUKEM Technologies GmbH / GNB. Currently in force is a Supplementary Agreement № 12 to the Contract of 9 December 2009 to expand the existing building for another 38 containers type CONSTOR 440/84. On 23 March 2011 a Protocol for establishing suitability for use of the construction site was issued - № 16 Model 01-11P-TPC. AND / 1.902.2, and on 25 March 2011 a Permission for utilization has been received № DK-07-NWR-32 / 25.03.11. An application for issuing of a permission for operation has been submitted to the NRA.

4.1.2. Project 2 - Treatment facility for liquid radioactive waste.

Construction of an installation for treatment of low level liquid radioactive waste. The facility is situated in AB-1, where water purification and conditioning of secondary radioactive waste will be carried out.

The contractor of the project is JSC Atomstroyexport. The supply and installation of the facility have been completed. Successful hydraulic tests on the installation have been conducted. Activities on the entering of the facility into operation have been carried out.

4.1.3. Project 5a - Equipment for extraction and immobilization of spent ion exchange resins.

Supply of equipment and technology for the extraction and conditioning of spent ion exchange resins.

The contractor of the project is the consortium Socoin Ingenieria y Construction Industrial S. LU, & Equipos Nuclears SA. In the framework of the project has been identified the need for full characterization of ion exchange resins prior to conditioning, so that the resulting conditioned product can fully meet the legal requirements, the technical design specifications and to comply with the requirements of SE RAW towards the final product. In addition to the project, a technical specification has been prepared for complete characterization of spent ion exchange resins, including identification of the critical for surface disposal of long-lived alpha radionuclides. An additional agreement has been prepared to the main contract for sample taking and characterization of resins and for a timetable for implementing these activities.

4.1.4. Project 5b – Facility with a high factor for volume reduction and immobilization of solid RAW.

The project provides technological solutions, manufacturing of equipment, construction and commissioning of a treatment facility for solid radioactive waste generated during operation

and during decommissioning activities of units 1-4. The contractor of the project is IBERDROLA Ingenieria y consruccion SAU with a subcontractor "Belgoprocess". The contractor has submitted a Technical Design and an Interim Safety Analysis Report, revision 1.

4.1.5. Project 5c – Preparation of an EIA report for the facility for treatment and conditioning of radioactive waste with a high factor of volume reduction (FVR)

A tender procedure has been carried out for selection of contractor.

Expected date for launching the project - July 2011.

4.1.6. Project 8a - Updating the strategy for decommissioning of units 1-4.

The project is envisaged to update the Strategy for decommissioning of units 1-4. It has been developed jointly by the Kozloduy NPP, SE RAW and KPMU and completed in March 2011

4.1.7. Project 8b - Plan for the decommissioning of Units 1 and 2

It has been executed independently by KPMU. The project has been completed and the Plan for decommissioning of Units 1 and 2 has been submitted to the SE RAW, which has acquired the units for ownership and management.

4.1.8. Project 8d - Plan for decommissioning of units 3 and 4 of Kozloduy NPP

The plan for the decommissioning of units 3 and 4 of Kozloduy NPP has been developed and submitted to the NRA for review in December 2010.

4.1.9. Project 9b – Facility for extraction and processing of the solid state from the tanks with evaporation concentrate (TEC)

For the purpose of characterization of the solid state, design, manufacturing of equipment, construction and commissioning of a facility for the extraction and processing of solid state from TEC in AB-1 and AB-2.

The contractor of the project is "Onet Tecnologies Grands Projects". The working design for stage 1 has been submitted to the Kozloduy NPP for approval.

4.1.10. Project 11b - Supply of containers for shipping and storage of materials generated during dismantling activities.

A pre project feasibility study has been performed and the necessary containers for transporting and storing of materials and waste have been specified.

4.1.11. Project 11c - Evaluation of stored materials and radiological survey of Kozloduy NPP units 1-4.

The project includes a quantitative assessment of operational radioactive materials and detailed assessment of the radiological condition of the equipment, structures, facilities and radioactive waste. The activities have been divided into 4 packages, namely:

1. Evaluation of induced activity for Units 1 to 4;

2. Calculation of radioactive contamination of Units 1 to 4, including steam generators;

3. Radiological investigation of Units 3 &4;

4. Radiological characterization of radioactive waste accumulated in units 1 to 4;

The report on the assessment of the tender proposals received has been completed.

4.1.12. Project 12a - Shop for crushing materials and decontamination.

The supply under project 12a includes design, construction, equipment supply, installation and commissioning of the Shop to reduce the size and deactivate the dismantled materials. A technical specification for delivery has been adopted. A tender procedure has been carried out.

4.1.13. Project 12b - Supply of equipment for separation of areas for reducing the size of the equipment during dismantling in Turbine Hall of units 1-4.

The project will ensure the design and supply of machines for cutting the dismantled equipment of large size, ventilation equipment for collecting the dust in the air during manual cutting and a laboratory for monitoring of surface contamination. A buffer zone and two zones for cutting will be organized in the Turbine Hall, equipped with manually operated machines and such with a remote control for size reduction.

Expected date to launch the project - August 2011.

4.1.14. Project 12c - Supply of manual instruments for the Shop for crushing materials and decontamination.

This project will provide for supply of tools for manual cutting.

4.1.15. Project 13a - Tools and equipment for dismantling in the Turbine Hall.

This project includes the delivery of a wide range of equipment necessary for dismantling activities in the Turbine Hall.

The project is divided into 7 lots.

The preparation of a new technical specification for Lot 1 has been completed by the present moment. The preparation of a new technical specification for Lot 5, merged with Lot 3 of the Project 13b has been initiated.

4.1.16. Project 13b - Tools and equipment for dismantling and reducing the size of machinery in the reactor hall.

This project includes the delivery of a range of conventional and special hand tools required for dismantling activities in the reactor hall and is divided into 8 lots.

4.1.17. Project 13c - Tools and equipment for dismantling and size reduction in Auxiliary buildings.

This project includes the delivery of a range of conventional and special hand tools required for dismantling activities in auxiliary buildings.

4.1.18. Project 13d - Devices for measuring for the purpose of release from control.

This project includes the supply and commissioning of a facility for measuring the radioactivity of materials and their radionuclide content for the purpose of releasing of the materials from regulatory control.

4.1.19. Project 15a - Construction of a central heating facility.

After the shut down of units 1-4 it has become necessary to have a backup system with a sufficient capacity to supply steam and hot water to the central heating system of the town of Kozloduy and the users on units 1-6 on the site of the Kozloduy NPP.

The project includes design, construction and commissioning of a boiler installation for steam and hot water whyich will remain as a back up system to the central heating system in case the two units in operation - Units 5 and 6 of the Kozloduy NPP are stopped for some reason.

Following a decision by the Ministry of economy, energy and tourism and after consultation with the Kozloduy NPP - and the EBRD, the scope of the ToR has been reduced to the

construction of a generating capacity only for the production of steam for technological purposes.

4.1.20. Project 16 - EIA for the decommissioning of units 1-4 of Kozloduy NPP

ToR has been prepared for the EIA, which has been co-ordinated with the MEW, Ministry of Health and Regional Inspectorate on Environment - Vratsa. A contract with Energiewerke Nord GmbH has been signed to implement the project.

On 15 October 2010 the Contractor has submitted for review and approval a revised version 1 of the EIA report, including non-technical summary and evaluation of the impact on protected areas.

On 29 October 2010 the comments by the Republic of Romania have been received in relation to the transboundary impact of the project. The requirements have been analyzed and reflected in the ToR.

4.1.21. Project 17 - SAR for the decommissioning of units 1-4 of Kozloduy NPP.

The project is divided into two projects - for Units 1 and 2 and Units 3 and 4.

The following documents have been prepared:

1. Safety analysis report for the decommissioning of Units 1 and 2 of Kozloduy NPP – Stage 1, Revision 3;

2.Technical report "Assessment of the source of radioactive contamination and of exposure dose during dismantling in the reactor hall."

4.1.22. Project 17b - SAR for the decommissioning of units 3 and 4 of Kozloduy NPP.

In the month of February 2011 the following reporting documents have been submitted to the Kozloduy NPP for review and approval, namely:

1. Safety analysis report for the decommissioning of units 3 and 4 of Kozloduy NPP – Stage 1, Revision 0A;

2.Technical report "Assessment of the source of radioactive contamination and of exposure dose during dismantling in the reactor hall."

4.1.23. Project 21 - Site for non radioactive waste from decommissioning.

Significant amounts of non radioactive waste will be generated during dismantling activities in Turbine Hall and non contaminated parts of the auxiliary buildings and reactor hall. Project 21 includes design, construction and commissioning of sites and/or depots for such waste. The feasibility study and technical design are performed by KPMU. At the present moment the project is at the stage of discussion of the feasibility study. A basic strategy is adopted for combining of Projects 19 and 21. Information has been received about the potential location of the storage sites.

4.1.24. Project 26 - Equipment for cutting and demolition of building structures in the Turbine Hall, Auxiliary Buildings and Reactor Hall.

Equipment for cutting and demolition of buildings of reinforced concrete in the Turbine Hall, Auxiliary Buildings and Reactor Hall during decommissioning. The scope of the project includes design, supply, installation, testing and commissioning of the equipment supplied.

4.1.25. Project 27 - Training and development of training materials for decommissioning.

For training of staff of Kozloduy NPP for the purpose of decommissioning of the units. It includes 10 training courses in the Kozloduy NPP Training center, as well as external training courses for training in other nuclear power plants. The scope of the project covers developing of

training modules on topics for decommissioning. At the end of May 2011 all materials in all training modules under Project 27 were submitted to the Kozloduy NPP.

4.1.26. Project 28 - Processing of accumulated radioactive waste.

This project is envisaged for supply of equipment for processing existing radioactive sludge and sediments on Units 1-4 of Kozloduy NPP through their extraction from the facilities and systems, where they have been accumulated and their processing into a form suitable for their further transportation, storage and disposal. ToR are being prepared. This project has been put on hold pending output data from Project 8c.

4.1.27. Project 30 – SAR for management of radioactive waste - Units 1 and 2 of the Kozloduy NPP.

The project was developed by KPMU for SE RAW. It was completed in 2010

4.1.28. Project 31 – Assessment of the remaining lifetime of the equipment remaining in operation during the decommissioning of units 1-4.

Performed by KPMU. On 17 June 2011 was adopted a methodology for assessing the remaining lifetime of structures and facilities which will remain in operation during decommissioning of units 1-4 of Kozloduy NPP - Revision 0.