THE REPUBLIC OF BULGARIA

FIFTH NATIONAL REPORT

ON FULFILLMENT OF THE OBLIGATIONS

ON THE JOINT CONVENTION ON

THE SAFETY OF SPENT FUEL MANAGEMENT AND ON

THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

Sofia, September 2014

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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 Basic Norms of 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

EBRD – European Bank for Reconstruction and Development

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

HLW – High Level Waste

HPA – Health Protection Act

IAEA – International Atomic Energy Agency

INRNE – Institute of Nuclear Research and Nuclear Energy

ISAR – Intermediate Safety Analysis Report

LLST – Low Level Sorbent Tank

LRC – Liquid Radioactive Concentrate

NCRBRP – National Centre for Radiobiology and Radiation Protection

NF – Nuclear Facility

NPP – Nuclear Power Plant

NRA –Nuclear Regulatory Agency

NDF – National Disposal Facility

PD – Personal Dosimetry

PP – Power Production of Kozloduy NPP

QMS – Quality Management System

RAW – Radioactive Waste

RAWPP – Radioactive Waste Processing Plant

RCC – Reinforced Concrete Container

RCCGIS - Reinforced Concrete Container For Gamma Irradiator Storage

RCCSS – Reinforced Concrete Container For Spent Sources Storage

RH – (Central) Reactor Hall

PLC – Processing Laboratory Complex

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 Pool

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, the Third and the Fourth National Reports of the Republic of Bulgaria presented the situation and efforts of 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 implementation of the legislative safety requirements.

In this Fifth National Report of the Republic of Bulgaria on the Joint Convention there is an update of the information presented in the previous reports and reflects the considerable changes in the RAW and SF policies and practices.

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 work on actualisation of the secondary legislation continued. Updates were made in the *Regulation on basic norms of radiation protection, Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy, Regulation on emergency planning and emergency preparedness in case of nuclear and radiological emergencies, Regulation on radiation protection during work activities with materials with increased concentration of natural radionuclides.*

In 2011 the Council of Ministers approved "Strategy for SF and RAW Management until 2030".

The construction of the Dry Spent Fuel Storage Facility (DSFSF) is finished. At the time of the development of this report the Programme for Commissioning has been practically implemented.

During the reporting period the SF has been completely removed from the SF ponds of Kozloduy NPP units 3 and 4, which is a substantial step in the transition process towards decommissioning. In 2013 these units have been declared by a decision of Council of Ministers as RAW management facilities with operator SE RAW.

The international cooperation in the field of SF and RAW management is of particular significance for the Republic of Bulgaria. The close contacts with the regulatory authorities of the EU member countries are maintained. The programmes of IAEA in the SF and RAW area are of particular importance in which Bulgaria will continue to participate actively.

This Report has been drafted in compliance with the Guidelines Regarding the Form and Structure of National Reports, INFCIRC/604/Rev.2, 7 September 2012. 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 full 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."

National Policy

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 polluter pays";
- The State is responsible for the management of RAW with unknown owner;
- RAW import is not allowed in the country, except for the cases defined in the ASUNE (re-import of disused 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 of disused SIR to the manufacturer;
- SF may be declared as RAW if 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;
- Timely processing after the generation of RAW until their conditioning for safe storage and disposal.

The policy of the Republic of Bulgaria in the area of SF and RAW management is based on the moral principle of avoidance of undue burden on future generations. The RAW and SF management principles are declared in the national *SF and RAW management Strategy* form 2004, restated and further developed in the approved by the Council of Ministers in 2011 *Strategy for SF and RAW Management until.*

In the strategy are defined the long - term specific policies and the main directions until 2030 regarding the management of:

Spent Fuel and High Level Waste

- The SF fuel generated within the country is a material containing useful components. This material should be re-processed in the country of origin or in a third country in an internationally acceptable and mutually beneficial economic, technological, and environmental friendly, manner;
- The SF whose reprocessing has been proven economically inappropriate, 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 shall be stored using the dry storage technology;
- The deep geological repository is accepted to be the most suitable option for durably guaranteed safety in the isolation of high level activity and long lived 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.

Radioactive Waste

- Minimization of the RAW generation, reuse and recycling of the waste, and release from regulatory control;
- Use of approved technologies for RAW processing;
- Ensuring timely disposal of the waste in the long term plan, as compared to their accumulation;
- Management of disused sealed radioactive sources;
- 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 shall 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;

Practices regarding the SF Management

SF Management in Kozloduy NPP

According to the design, the SF in Kozloduy NPP is stored for a period of 3 years in the at reactor ponds, following which it is transported back to the former Soviet Union for re-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 Kozloduy NPP units 1-6 (initially supplied as fresh nuclear fuel up to 2002) a long-term framework agreements was signed with the Russian company OAO Techsnabexport in 1998 for WWER-440 and in 2000 for WWER-1000 according to which the SF is shipped back to Russia on a regular basis. By an order of the Government of the Russian Federation in 2008 the performance of the activities regarding the acceptance of SF for reprocessing have been transferred to the FGUP Federal Centre for Nuclear and Radiation Safety. For the SF (originally supplied as fresh fuel after 2002) contracts have been placed with the Russian company OAO

TVEL. By the means of the two long term agreements (for reprocessing of SF from WWER-440 and WWER-1000) from 2011 to 31.12.2013, 1920 SF assemblies from WWER-440 estimated at around 220 metric tons of heavy metal have been transported. The total quantity transported for the period 1998 – 2013 is 3808 SF assemblies from WWER-440 and 959 SF assemblies from WWER-1000, estimated at 864 metric tons of heavy metal.

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

In the month of July 2012 the Spent Fuel was completely removed from SF Pools of Units 3 and 4. In this regard, in November 2012 the Council of Ministers declared Kozloduy NPP Units 3 and 4 as RAW Management Facilities and there were transferred for operation to the SE RAW through its Specialized Division "Decommissioning – Kozloduy" In February 2013 the SE RAW was granted a License for operation of units 3 and 4 as RAW Management Facilities, which are to be decommissioned. In that regard with the issuance of the new licenses to SE RAW the licenses of Kozloduy NPP for operation of Units 3 and 4 were terminated. At the moment Units 1 - 4 have licenses for operation as RAW Management Facilities. In this regards the Units 1 - 4 are withdrawn from the list of SF Management Facilities, subject of this report.

The SF from Units 5 and 6 is stored until its shipment to Russia or WSFSF. The SF pools are located in the containment of the respective unit. They are divided into 4 parts, physically separated by walls. Three parts are allocated for immediate storage of the SF assemblies, while the fourth area is used for transport and handling operations with fresh and spent fuel. The storage racks and the assemblies are also in the fuel storage areas.

In Kozloduy NPP there are two SFSFs for fuel from WWER-440 and WWER-1000 reactors. In the wet SFSF the Spent fuel is stored in transport baskets under water in 4 pools. In 2006 the storage is equipped with a refuelling machine for fuel from WWER-1000 and WWER-440 reactors.

According to the national strategy for Management of SF and RAW, the Updated strategy for decommissioning of Units 1-4 in Kozloduy NPP and the signed in 2001 with EBRD Framework agreement for financing, in 2012 started the commissioning of the Dry Spent Fuel Storage Facility (DSFSF) from WWER-440 for a period of 50 years and a capacity of 72 containers or 6048 assemblies from WWERR-440 reactors in accordance with the conditions of the issued by BNRA permit № O-3571 from 24.11.2011 for commissioning of Nuclear Facility for – Dry Spent Fuel Storage Facility, valid for 3 years. The storing technology is a container system with air-cooled containers trough natural convection CONSTOR 440/84 type with a capacity of 84 assemblies. The containers are loaded with SF 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. Until the end of 2013 252 assemblies in 3 containers have been loaded in the Storage Facility.

Long –term Management of SF

To adhere to the requirement for assuring sufficient number of free slots in SFP 5 and 6 for emergency core discharge, taking into account the current fuel cycles with loading of 42/48 fresh fuel assemblies TVSA every year it is necessary to perform one shipment (96 TVSA) each year, the shipments from Unit 5 and 6 are alternating over every year.

Until the commissioning of the DSFSF the spent fuel from Units 5 and 6 were shipped mainly to Russia and to lesser degree to the DSFSF, which was used as an intermediate storage facility. At the present time in SFSF are stored 96 assemblies from WWER-1000.

After the commissioning of the DSFSF it is foreseen that the SF from WWER-440 is to be transported in the DSFSF and shipped for reprocessing, while the released capacity of the SFSF is going to be used mainly for interim storage of SF from WWEWR-1000.

The HLW and SF management principles are determined in the Strategy for SF and high level waste management from 2004, reviewed and adopted by the Council of Ministers on 05.01.2011.

In 2013 the Ministry of Economy and Energy initiated an actualization of the National Strategy. The actualization process is still going on.

Detailed information regarding the main technical specifications and the safety assurance for SFP of Units 5 and 6 is presented in Annex L-1.

RAW Management practices

RAW management 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 processing of institutional RAW.

The operators of nuclear facilities and the licensees for activities with other sources of ionising radiation (SIR) process (to a certain extent) and store at the sites all generated RAW for an interim storage, until their transfer to SE RAW.

The SE RAW, as an operator of a nuclear facility for RAW management, performs processing and storage and after the construction of a National repository will perform also the deep geological disposal of the conditioned RAW. Till the commissioning of the national disposal facility, RAW are stored in interim storage facilities.

RAW Management at Kozloduy NPP

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

The solid RAW in the controlled area is collected separately in points for presumably "non-contaminated" waste and points for RAW. They are sorted according to the dose rate characteristics and the type of the material – mainly compactable and non-compactable.

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

From 2001, a separate RAW management Facility is in operation at the Kozloduy NPP. The operator of the Facility for processing and storage of low and intermediate level solid and liquid waste is SE RAW through SD RAW-Kozloduy.

The compactable solid RAW are compacted in 200 litter drums in 2 stages: preliminary compaction in the drums by a load of 50 tones and compaction of the drums themselves by a load of 910 tones.

The processing of the liquid RAW covers the concentration by evaporation and conditioning using the cementation method.

For the packaging of RAW is used a reinforced concrete container with net volume of 5 m^3. The packaging of the processed compactable and non-compactable solid RAW is performed according to their radionuclide composition:

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

The conditioned RAW is stored in a storage with a 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

The Sources of Ionizing Radiation (SIR) are used in more than 2000 different industrial, medical, agricultural and scientific national sites. The disused sources are to be transferred to the SD RAW – Novi Han without pretreatment. In SD RAW – Novi Han the transferred RAW are treated in installations for cementing, abrasive decontamination, decrease of the volume of solid RAW trough compaction. Due to the high number of accepted for storage fire detectors - over 100 000 (mainly with Pu and Am sources) new technological solutions have been developed for reducing their volume and further placing in a fire-proof packages. In the facility are stored conditioned and non-conditioned RAW.

The stored contaminated liquid solutions at the site of the research reactor IRT- 2000 (from radiochemistry laboratories, spec. sewage and the spent fuel pool) are to be timely transported to the Kozloduy NPP for treatment. The solid RAW from the operation of the reactor including the disused SIRs used in the laboratories of the INRNE are stored in the near reactor storages of IRT-2000 until their transportation to the SD RAW – Novi Han for treatment and/or storage. The generated RAW during the partial dismantling of the equipment of the IRT-2000 are processed and stored packaged in reinforced concrete containers type RCC at the site of the nuclear facility.

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

RAW from uranium mining and milling

The uranium industry in the Republic of Bulgaria was operating over 40 mining sites and two hydrometallurgical plants. The generated waste materials with increased concentration of natural radionuclides have been stored in tailings ponds and dirt piles. In 1992 the uranium mining in Bulgaria was suspended by a decision of the Government.

The measures in the field of uranium industry are aiming to eliminate the consequences from the mining and milling of uranium ore within the framework of environmental management. The main objective is remediation of the uranium mining legacy sites and elimination of the risk for the public health in these regions.

RAW from the uranium industry are stored safely at site and/or is disposed in trenches at the dumping grounds and the tailings ponds. It is allowed for deposition in the uranium mine galleries. Technologies and disposal sites are defined in the projects for technical liquidation and remediation.

Criteria for classification of RAW

The information of the Classification of RAW in accordance with the *Regulation for safe management of radioactive waste* is presented in the previous National reports. It is underlined that the Classification system is oriented towards disposal of RAW.

The classification of RAW is presented in Annex L-7.

SECTION C. AREA OF APPLICATION

All of the spent fuel on the territory of the State is in the scope of the Convention.

Radioactive waste containing only natural radioactive substances, generated outside the nuclear fuel cycle except sealed radioactive sources are not to be declared as RAW for the purposes of the Joint Convention.

RAW generated as a result of nuclear applications in sites of the Ministry of Defence are managed as RAW from the civil programmes for nuclear applications and are declared for the purposes of the Convention.

SECTION D. INVENTORIES AND LISTS

ARTICLE 32. REPORTING (paragraph 2)

"2. This report shall also include:

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

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

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

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

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

(b) has been disposed of; or

(c) has resulted from past practices.

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

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

Spent Fuel Management Facilities

The Republic of Bulgaria operates the following SF Management Facilities with their specific features and SF quantities (by 31.12.2013):

Facilities operated by Kozloduy NPP

Unit 5 at the reactor SF storage (Spent Fuel Pool - 5)
Location: in the reactor hall of unit 5, next to the reactor;
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): 392 pcs./ 156 659 kg

Unit 6 at the reactor SF storage (Spent Fuel Pool - 6)
Location: in the reactor hall of unit 6, next to the reactor;
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): 384 pcs./ 153 997 kg

Wet Spent Fuel Storage Facility (WSFSF)
Location: at the Site of Kozloduy NPP, nearby Units 3 and 4;
Purpose: Storage of the SF from all Units at the Site;
Storage method: under water, in 4-partition pool;
Capacity (casks): 168, conditionally - 200
SF stored (number of assemblies/kg heavy metal): 3336 pcs./ 456 732 kg

Dry Spent Fuel Storage Facility(DSFSF)
(in commissioning)
Location: At the Kozloduy NPP Site, nearby the existing building of the SFSF;6
Purpose: long term storage of WWER-440 SF;

Storage method: dry in metal-concrete containers type CONSTOR 440/84;
Capacity (containers): 72
Stored SF (number of assemblies/kg heavy metal): 252 pcs./ 29 131 kg

Detailed information on the SF management facilities and inventory of the spent fuel can be found in Annexes L-1 and L-2 of this report.

RAW Management Facilities and inventory of the RAW

The Republic of Bulgaria operates the following RAW Management Facilities with their specific features and RAW quantities by 31.12.2013:

Facilities operated by Kozloduy NPP

Auxiliary building -3 (AB-3)
Location: separate building at the Kozloduy NPP site, close to Units 5 and 6;
Purpose: processing of liquid and storage of solid RAW from Units 5 and 6;
Processing methods: evaporation, filtration;
Storage Capacity / volume of the stored solid RAW, m^3: 2486 +213 / 615
Storage Capacity / volume of the stored liquid RAW, m^3:
Liquid radioactive concentrate: 3600 / 1675
Spent ion exchange resins: 200 / 135

Facilities operated by SD Decommissioning - Kozloduy

Auxiliary Building-1 (AB-1)
Location: separate building at the Kozloduy NPP site, close to Units 1 and 2;
Purpose: processing of liquid RAW and storage of solid and liquid RAW from Units 1 and 2;
Processing methods: evaporation, filtration;–
Storage Capacity / volume of the stored solid RAW, m^3: 1010 / 300
Storage Capacity / volume of the stored liquid RAW, m^3:
Liquid radioactive concentrate: 2350 / 2000
Spent ion exchange resins: 1076 / 368

Auxiliary Building -2 (AB-2)
Location: separate building at the Kozloduy NPP site, close to Units 3 and 4;
Purpose: processing of liquid RAW and storage of solid and liquid RAW from Units 3 and 4;
Processing methods: evaporation, filtration;–
Storage Capacity / volume of the stored solid RAW, m^3:1010 / 320
Storage Capacity / volume of the stored liquid RAW, m^3:
Liquid radioactive concentrate: 2350 / 1690
Spent ion exchange resins: 1076 / 240

At reactor Storage in Reactor Hall-1
Location: in the reactor hall of Units 1 and 2,
Purpose: storage of operational solid RAW category **2**, additional category 2-III;
Storage method: unprocessed form;
Storage Capacity / volume of the stored solid RAW, m^3: 81.6 / 52

At reactor Storage in Reactor Hall-2
Location: in the reactor hall of Units 3 and 4;
Purpose: storage of operational solid RAW category **2**, additional category 2-III;
Storage method: unprocessed form;
Storage Capacity / volume of the stored solid RAW, m^3: 81.6 / 32

RAW processing plant (RAWPP)
Location: at the Kozloduy NPP site, close to AB-3;
Purpose: treatment and conditioning of solid and liquid RAW category 2;
Treatment methods: compaction of solid RAW and evaporation of liquid RAW; chemical and

electrochemical decontamination of metal RAW;
Conditioning methods: immobilization in cement, packaging in reinforced concrete containers.
Capacity of RAW treatment, m^3/year: liquid - 450, solid - 1500

Storage facility for conditioned RAW (SFCRAW)
Location: at the Kozloduy NPP Site, closely to RAWPP;
Purpose: storage of conditioned in RAWPP category 2 RAW;
Storage capacity/volume of the stored RAW, number of packages RAW: 1920 / 1368.

Trench storage facility
Location: Lime Plant, at the Kozloduy NPP Site;
Purpose: storage of treated and not treated solid RAW category 2;
Capacity / volume of the stored RAW, m^3: 3860 / 2335.

Storage facility for processed solid RAW
Location: Lime Plant, at the Kozloduy NPP Site;
Purpose: storage of treated solid RAW category 2;
Capacity / volume of the stored RAW, m^3: 1130 / 327;

Sites (№1 and №2) for storage of solid RAW in reinforced concrete containers
Location: Lime Plant, at the Kozloduy NPP Site;
Purpose: buffer storage of processed solid RAW category 2-I and 2-II, packaged in reinforced concrete containers;
Capacity / volume of the stored RAW, number of packages: 2000 / 279.

Site for storage of solid RAW in freight containers
Location: Lime Plant, at the Kozloduy NPP Site;
Purpose: Storage of untreated and treated low radioactive solid RAW category 2-I in standard ISO-containers;
Capacity / volume of the stored RAW, m^3: 420 / 180.

Storage facility for contaminated soil
Location: Lime Plant, at the Kozloduy NPP Site;
Purpose: Storage of soil, construction and other bulk technological waste with very low level of contamination;
Capacity / volume of the stored RAW, m^3: about 8000 / 0.

Facilities operated by SE RAW – Novi Han SD

Storage for Solid RAW
Purpose: storage of unconditioned solid low and intermediate radioactive short-lived RAW, category 2a
Capacity / volume of the stored RAW, m^3: 237 / 80

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

Disused Sealed Sources Storage
Purpose: Storage of unconditioned disused Sealed Sources, Category 2a and 2b.
Capacity / volume of the stored RAW, m^3: 1 / 0.65.

Engineering trench for solid RAW
Purpose: Storage of unconditioned solid low and intermediate level short lived wastes, Category 2a
Capacity / volume of the stored RAW, m^3: 200 / 160

Storage for Liquid RAW
Purpose: storage of transient wastes, Category 1 and low level short lived liquid RAW, Category 2a;
Capacity / volume of the stored RAW, m^3: 48 / 25.

Storage sites № 1 and 1A for storage of solid RAW
Purpose: storage of solid RAW, Category 2a and 2b, in standard ISO-containers.
Capacity / volume of the stored RAW, m^3: 476 / 215

Storage site № 2 for solid RAW
Purpose: storage of low and intermediate level RAW category 2a and 2 b in reinforced concrete containers type PEK, StBKUB, RCC, StBGOU.
Capacity: 7 slots for PEK containers, 171 slots type StBKUB, 60 slots for RCC and 18 slots for StBGOU.

Storage site № 4 for solid RAW
Purpose: temporary storage of solid RAW category 1, 2a and 2b, in 200-litter metal drums,
Capacity / volume of the stored RAW, m^3: 80/ 76.

Complex for Processing of RAW
Location: at the site of SE RAW – Novi Han SD
Purpose: characterization and processing of solid RAW, Category 1, 2a and 2b and liquid radioactive solutions;
Methods of treatment: fragmentation, compaction AW, evaporation of liquid RAW, abrasive decontamination of metal RAW;
Methods of conditioning: cementing of solid and liquid RAW, packaging of solid RAW.

Facilities operated by INRNE - BAS

Storage for Reactor equipment
Location: separate building at the **IRT-2000** site;
Purpose: storage of operational low level solid RAW, Category 2;
Capacity / volume of the stored RAW, number of packages: for the whole lifetime of the IRT-2000 / 6 pcs. 200-litter drums, dismantled equipment.

Storage Site for solid RAW in RCC
Location: at the IRT-2000 site;
Purpose: storage of processed solid RAW from the partial dismantling, Category 2, packaged in RCC;
Capacity / volume of the stored RAW, number of packages: 14 / 6.

Facilities of closed uranium mining

Tailings Pond Buhovo-1
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, Million m^3: 1.3 / 1.3.

Tailings Pnd Buhovo-2
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 RAW, Million m^3: 10 / 4,5 Million. tons

Tailings Pond Eleshnitsa
Location: 3,0 km south-east form 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: 231 ha / 9 Million tons

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

Installation 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.

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 stage

There are no nuclear facilities in Bulgaria licensed for decommissioning.

The first four Units of Kozloduy NPP are permanently shut down. They are in different steps of transition from operation to decommissioning.

Units 1 to 4 have licenses for operation as RAW Management Facilities. There is no spent nuclear fuel at the sites of the units, the RAW generated during the operation period is being managed and the necessary preparations for decommissioning (development of documentation, ensurance of the needed equipment, devices and tools) are in progress.

Detailed information on the upcoming decommissioning of these units is presented in this Report, in article 26

SECTION E. LEGISLATIVE AND REGULATORY SYSTEM

ARTICLE 18. 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 previous National reports.

An overview of the legislative and regulatory framework in the field of use of nuclear energy for peaceful purposes in the Republic of Bulgaria has been made in the previous national reports. The *ASUNE* and the *Health Act* as well as the regulations for ensuring regulatory control by the NRA and the implementing of the ASUNE have been presented. The requirements for the issuance of permits and licences, as well as the duties of the Chairman of the NRA, related to the issuance, amendment, renewal and termination of licenses and permits have been presented as well. The requirements for state control in the management of radioactive waste and spent fuel have also been presented.

The key participants in the process for management of RAW and SF at the national level (Council of Ministers, NRA, SE RAW jointly with its specialized divisions and the holders of permits and licenses) have been described as well as the relationships between them ensuing from the law.

The amendments in the ASUNE introduced in 2010 and the process of harmonization of regulatory requirements in the WENRA Member States have been presented too.

Amendments in the legislative and regulatory framework

The NRA maintains a programme for review of all secondary legislation on implementing the ASUNE including review and update of the existing regulations, as well as developing new ones. The review of the secondary legislation is carried out periodically in case of amendments in the law and in case of transposition of international documents into the national legislation.

The ASUNE and the regulations on its implementation entrust to the Chairman of the NRA the responsibilities for enforcing the law and providing interpretation and guidance on the implementation of the legislative requirements.

In the period between 2011 and 2014 amendments and supplements have been introduced to the *Regulation on Basic Norms of Radiation Protection*, the *Regulation on Safety of Radioactive Waste Management, Regulation on the procedure for issuing licenses and permits for safe use of nuclear energy, the Regulation on emergency planning and emergency preparedness in case of a nuclear and radiological emergency, the Regulation on ensuring the safety of management of spent nuclear fuel*, a new *Regulation on radiation protection during activities with materials with high content of*

natural radionuclides and the *Regulation on radiation protection during activities with sources of ionizing radiation*.

The new *Regulation on basic Norms of radiation protection* is consistent with the new ASUNE as of 2010, "GSR Part 3" of the IAEA (2012) and determines the following, namely:

- The general principles, requirements and measures for radiation protection;
- The basic (primary) limits of the doses from external and internal exposure;
- Derivative (secondary) limits for external and internal exposure;
- Limits for the purpose of radiation control and planning of the protection;
- Criteria and levels for releasing of material from regulation and the requirements for demonstrating compliance of the materials with these criteria.

In connection with the amendment and supplement of the Act on the Safe Use of Nuclear Energy (ASUNE) a review of the existing regulations for its implementation has been carried out. The new *Regulation on the Safety of Radioactive Waste Management* is in accordance with Directive 2011/70/Euratom establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste (OJ, L 199/48 of 02.08.2011) and the ASUNE, consistent with the current documents of the International Atomic Energy Agency (IAEA) and the reference levels of the Western European Nuclear Regulators Association (WENRA) in the field of management of radioactive waste and spent nuclear fuel.

The most important amendments in the *Regulation on the Safety of Radioactive Waste Management* are the following, namely:

- A classification of radioactive waste is introduced, in which the IAEA standard GSG-1 is adapted;
- The requirements towards the dose limits for the population have been updated;
- In accordance with the recommendations of the IAEA a requirement is posed to the geological formation, in which the facility for the disposal of high level radioactive waste will be situated, so as to provide isolation of radioactive waste from the biosphere for at least 100 000 years;
- The requirements towards the contents of the plan for closure of the facility for disposal of radioactive waste have been regulated;
- The procedure for determining the responsibilities for implementing the control after the closure of disposal facilities has been regulated too;
- The concept for transition to an integrated management system in accordance with the safety standards of the IAEA has been reflected;
- Requirements to perform periodic safety review have been posed before the licensee;
- Requirements to apply a graded approach have been introduced.

The major amendments in the *Regulation for safety of spent fuel management* are as follows:

- The basic principles and requirements for spent fuel management have been updated;
- Chapter seven “Management system” has been completely revised, the new IAEA concept for transition to an integrated management system being introduced.

With the *Regulation on the Safety of Radioactive Waste Management* and with the amendments and supplements to the *Regulation for safety of spent fuel management,* the Directive 2011/70/Euratom establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste has been transposed.

Pursuant to the *Regulation on the procedure for issuing licenses and permits for safe use of nuclear energy,* for the purpose of issuing of permits and licenses, it is necessary for the applicant to have proof of an organizational structure for maintaining a high level of safety as well as to have ensured compliance of the facilities and the declared activity with the requirements, standards and rules on nuclear safety and radiation protection, to have developed a system for maintaining of a high level of safety culture and organization of work that allows the exposure doses to the personnel and the population to be kept as low as reasonably achievable. The regulation requires the submission of a preliminary, intermediate or final Safety Analysis Report (SAR) in the following cases, namely:

- Preliminary SAR – following the approval of the selected site;
- Intermediate SAR – for the approval of the technical design of the nuclear facility;
- Final SAR – on the issuance of a license for operation or the renewal of the existing license for operation.

In cases where there is an application for a permit to implement amendments, the provisions of that regulation require also the submission of the amended parts and sections of the Safety Analysis Report for nuclear facilities having relation to the amendments that will take place.

The *Regulation on emergency planning and emergency preparedness in case of nuclear and radiological emergencies* determines the following, namely:

- The conditions and order for the development of emergency plans; the persons who implement the emergency plans and their duties; the actions and measures for mitigation (localization) and liquidation of the consequences of a nuclear or radiological accident; the ways of informing the public; the procedures for maintaining and testing of the emergency preparedness.
- The risk categories of sites, facilities and activities, as well as classification of accidents. For this purpose, the recommendations of the IAEA GS-R-2, "Preparing and responding to nuclear or radiological emergency." Have been followed
- Intervention levels as values of the estimated dose and the preventable dose for a period of time, the dose rate and the specific activity upon reaching of which the implementation of protective measures should begin.

The *Regulation on radiation protection during work activities with materials with increased* concentration *of natural radionuclides* was issued on the basis of art. 26 par. 5 of the ASUNE. Ordinance specifies requirements and radiation protection measures, control and reduce the exposure in operations with high content of natural radionuclides, which include: 1 production, processing, storage and transportation of materials with high content of natural radionuclides; 2 disposal and recycling of residues listed in Annex № 2; 3 repair and disposal of IT equipment contaminated by superposition and sorption of natural radionuclides.

Materials and process equipment subject to disposal are treated as radioactive waste under ASUNE if it is found that the radiation risk to workers and members of the public is significant. Full list of existing regulations applicable to the management of radioactive waste and spent fuel is given in Annex L-5.

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.'

Brief review of the information presented within the previous national reports

In the previous national reports it is indicated that pursuant to the ASUNE the state regulation of the safe use of nuclear energy and ionizing radiation and the safe management of radioactive waste and spent fuel management is implemented by the NRA Chairman which is an independent specialized body of the executive power and its competencies are defined by a law. The Chairman of the Agency shall be designated by a Council of Ministers decision and is appointed by the Prime Minister for a term of five years and may be appointed for another mandate. It is noted that by the Act on the ratification of the Joint Convention, the NRA Chairman is designated as a regulatory authority pursuant to Art. 20 of the Convention, and for coordinator for the preparation of the national reports, on the fulfilment of the obligations of the Republic of Bulgaria ensuing from this Convention.

The organizational and management structure of the NRA is presented. A detailed information on the number of personnel and on the funding of the Agency has been presented. The constituted pursuant to the ASUNE Advisory Councils on Nuclear Safety and Radiation Protection are presented as well.

It is stated that the ASUNE ensures effective independence of the regulatory functions from the functions on management of radioactive waste. The functions of the Minister of Economy and Energy are described, who implements the state policy in the field of management of RAW and SF.

Amendments in the legislative and regulatory framework

With the amendments in the ASUNE, the provision of the regulatory body with sufficient resources is displayed as a basic principle in art. 3 of the Act. It is indicated that the competent authority exercising the state regulation of the safe use of nuclear energy and ionizing radiation is allotted with the human and financial resources sufficient to carry out its responsibilities in full.

Development of the regulatory authority after the presentation of the third national report

Over the past three years there have been no changes in the functions of the NRA, accordingly no changes have occurred in the organizational structure. According to the Rules of Procedure, the NRA has 114 job positions. At the end of 2013, 103 job positions have been occupied, of which 79 civil servants.

Staff Structure by age:

Age/ Positions	Up to 29 years	30-44 years	45-59 years	60 years and above 60	Total
Managereal	-	2	11	6	19
Expert	10	30	26	14	80
Technical		3	1		4
Total for NRA		35	38	20	103
Percentage	10 %	34 %	37 %	19%	100 %

The implemented in the Agency policy for transfer of knowledge and skills from the more experienced to the younger employees ensures the continuity in the organization and the preservation of the well established professional practices.

All expert positions are occupied by employees with higher education - degree "Master", some of them having the scientific degree PhD. In general, 90% of all employees have higher education, the other employees - 10% have secondary education. The employees with higher education are mainly in the field of technical and natural sciences. The ratio of management positions occupied by women and men, as well as the expert positions is kept the same (56:44 in favour of women). The professional recruitment of personnel in the NRA is done in compliance with the requirements of the Civil Servants Act, the Labour Code and the Regulation on carrying out competitions for appointment of civil servants. The requirements towards the candidates are targeted not only on professional competence, but also on the personal qualities of the candidates, the ability to work in a team, the desire for development, communication skills, leadership and managerial competence - for managerial positions and others.

The general training of the employees in the NRA is carried out in the form of training courses, seminars for training of employees in different areas of administrative activity. The training is conducted by the Institute for Public Administration and European Integration according to an annual plan. The newly appointed employees in the state administration undergo a course on "Introduction to the Civil Service" which is part of the professional development training. The foreign language training is focused on the development of communication skills based on specialized vocabulary and such, giving the opportunity for better communication with the European institutions.

The hosting of a series of national and international technical meetings, training courses and seminars is aimed at familiarizing the employees with the international and national practices for application of the regulatory approach, the requirements of the new regulatory framework, establishing of the secondary legislation in accordance with the ASUNE and the European legislation.

The appraisal of the employees is carried out according to the Regulation on the conditions and order for appraisal of civil servants.

Financing of the NRA

The revenue that NRA realizes is income from fees pursuant to the ASUNE and the Tariff of fees, collected by the NRA pursuant to the ASUNE.

The NRA budget is negotiated directly with the Ministry of Finance of the Republic of Bulgaria. The Law on the State Budget of the Republic of Bulgaria for 2013 allots to the NRA expenses in the amount of 5 766 900 BGN. For the current year, the NRA income from state taxes has been in the amount of 7 552 402 BGN and the income from interest in the amount of 69 168 BGN.

The NRA can negotiate technical assistance from national and international expert organizations and spends an average of about 1 million BGN on technical assistance.

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 overview of the information presented within the previous national reports

The provisions of the ASUNE have been presented, related to the activities on management of RAW and SF. It is stated that the management of radioactive waste and of spent fuel is performed by legal entities only after obtaining a permit and/or a license for the safe conduct of the respective activity. The obligations and responsibilities of the licensee ensuing from the ASUNE have been presented in detail.

It is stated that RAW and SF whose owner is not known, represent state property (Article 73 of the ASUNE) and that the Chairman of the NRA designates the entity to whom they are transferred and the conditions thereof.

The requirements of the secondary legislation related to the liability of the holder of the permit or the license are presented.

The Directive 2009/71/EURATOM establishing a Community framework for nuclear safety of nuclear installations has been transposed in the ASUNE and the fundamental safety principles established by the IAEA document SF-1 "Safety Fundamentals" have been introduced. The responsibility for ensuring nuclear safety and radiation protection lies in full by the entities responsible for the facilities and activities, and cannot be transferred to others.

Amendments in the legislative framework related to the responsibility of the permit holder

A new *Regulation on the Safety of Radioactive Waste Management* was adopted in 2013. The regulation specifies that the entities as a result of whose activities is generated RAW, are responsible for their safe management from the moment of their generation until their transfer to the State Enterprise "Radioactive Waste" or their release from regulatory control. The requirements towards the licensee have been delineated in detail. It is necessary that the licensee should have an organizational structure for maintaining a high level of safety, as well as to have provided compliance of the facilities and the declared activities with the requirements, standards and regulations on nuclear safety and radiation protection, to have developed a system to maintain a high level of safety culture and work organization that allows that the exposure doses for the personnel and the population be kept as low as reasonably achievable.

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 overview of the information presented within the previous national reports

The provisions of the ASUNE requiring the availability of sufficiently qualified and competent personnel with the relevant level of education and training for all activities related to the operation of the facilities for management of SF and RAW. The system for obtaining qualification and for conducting specialized training of personnel in nuclear facilities has been presented.

The conditions for issuing a licence to operate a nuclear facility pursuant to the act have been described, which are related to the availability of sufficient financial and material resources to maintain a high level of safety for the entire lifetime of the facility as well as for the purpose of decommissioning of facilities for management of SF and RAW.

The documents have been specified which the applicant must submit together with the application for issuing a license or a permit and by which he certifies the availability of sufficient financial and human resources. In the framework of the procedure for issuing of a license, the regulatory authority evaluates the correspondence of the submitted documents as well as of the declared data and circumstances with the provisions of the ASUNE and the secondary legislation issued for its implementation.

The provisions of the Regulation on the terms and conditions for acquiring professional qualification and on the procedure for the issuance of licenses for specialized training and of certificated for qualification for the use of nuclear energy have been presented.

Amendments in the legislative framework related to the human and financial resources

During the reporting period, there have been no amendments in the legislative framework related to human and financial resources.

Financing of the process of decommissioning and management of RAW.

The financing of the management of SF and RAW at the Kozloduy NPP during operation is carried out by the operator.

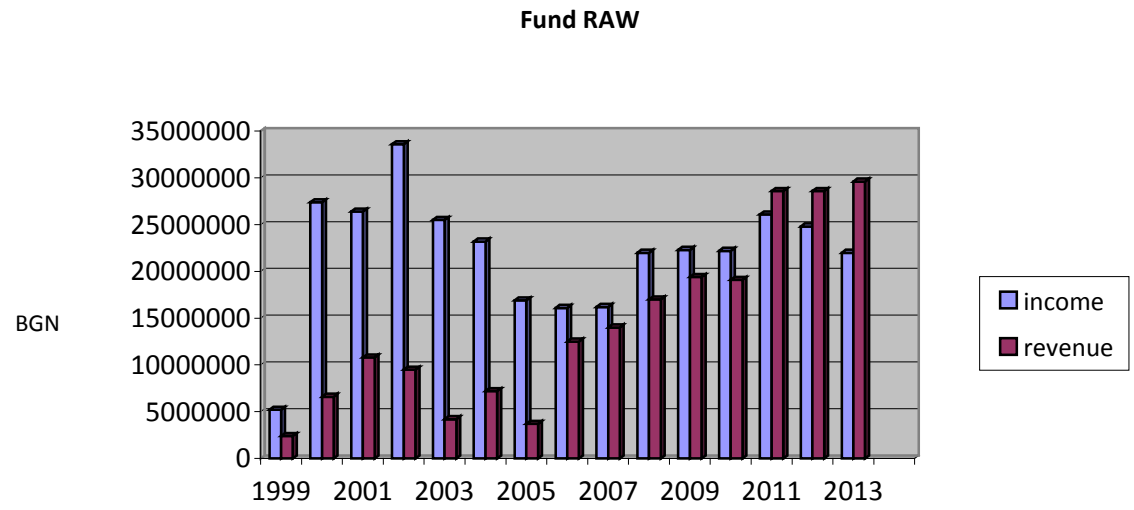
The financing of the process of decommissioning and the management of RAW after its transfer to the SE RAW is implemented by the Fund Decommissioning and the Fund RAW. These funds are targeted and are managed according to the existing legislation so as to ensure the following, namely:

- Sufficient financial means which will always be available in order to avoid the imposing of undue burden on the future generations;
- Fair proportional distribution of the expenses on the management of RAW and SF between their sources of origin;
- The effectiveness of the expenditure specific for RAW or SF management;

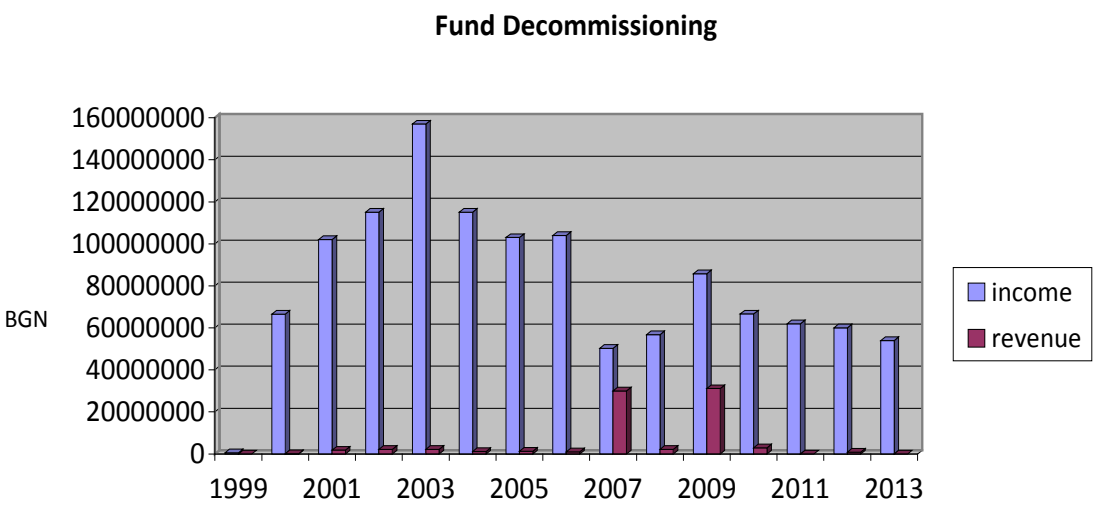
- Transparency in the management of the financial resources, which should ensure that these resources will not be diverted improperly for other purposes.

According to the current legislation, the volume of spending from the fund RAW is dependent on the timing of the activities planned in the "Strategy for the safe management of spent fuel and radioactive waste" in force and the current annual work programmes of the SE RAW. The financial resources accumulated in the funds are spent for an indefinite period of time. At the end of 2013 the financial balance of the fund RAW with accumulation is 135 million BGN.

Currently the main financial resources accumulated in the fund RAW represent contributions by the Kozloduy NPP, being a company with the highest percentage of generated radioactive waste. Assuming that the volume of production will remain the same, as well as the amount of the contribution and the price of electricity, in the next five years it is expected that about 110 million BGN, undiscounted and without calculated interest will be accumulated in the fund RAW.



At the end of 2013 there 1 273 626 152 BGN accumulated in the Fund Decommissioning.



Assuming that the volume of production will remain the same, as well as the amount of the contribution and the price of electricity, in the next five years it is expected that about 275 million BGN, undiscounted and without calculated interest will be accumulated in the Fund Decommissioning.

Information on the practical application of the provisions of this Article by the operators of facilities for management of SF and RAW 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 overview of the information presented within the previous national reports

In the framework of the previous national reports, the provision of the ASUNE has been presented requiring the entities engaged in activities on the management of radioactive waste and spent fuel to maintain a high level of quality of the activities performed. The requirements of the, at the time existing regulations, have been presented too. It is stated that the implementation of the programme of quality assurance is controlled by the NRA during the regulatory inspections. Information has been presented on the established systems for quality management in the Kozloduy NPP and SE RAW.

The systems for quality management have been presented and the actions have been described, taken by the licensees for transition to an integrated management system in relation to the requirements of the new safety standard of the IAEA GS-R-3 "System for management of facilities and activities."

Amendments in the legislation

The new *Regulation on the Safety of Radioactive Waste Management* transposes in the national legislation the requirements of GS-R-3 regarding the management system of the operators of facilities for RAW management.

Development in the systems for quality management of the operating organizations.

Quality Assurance in the Kozloduy NPP

In 2012 the Kozloduy NPP has introduced a management system (MS), which integrates all aspects of management. The MS has been established:

- In accordance with GS-R-3: 2006 "Management system for facilities and activities" and other applicable standards and safety guides of the IAEA safety;
- Taking into account the requirements of BDS EN ISO 9001 "Systems for quality management. Requirements.", BDS EN ISO 14001 "Systems for Management of the environment" and BS OHSAS 18001 "Systems for managing of health and safety at work";
- Applying national and international legislation having bearing on the activities of the Kozloduy NPP.

The MS of the Kozloduy NPP is based on the process approach, the ongoing activities being structured in processes (management, basic and auxiliary) determined on the basis of the graded approach. For each process of the MS of the Kozloduy NPP there are responsible officials designated with the necessary functions and authorities.

This is a condition for the development and continuous improvement of the safety culture, where safety is the highest priority and is of the utmost importance for the long-term success of the power plant.

The state and the ability of the MS to achieve the objectives of the power plant are evaluated at a management review, which takes place once a year. During this review are approved also the measures for development and improvement of the MS.

The documentation of the Management system covers:

- Policy statements, declarations, strategies of the Kozloduy NPP";
- Description of the management system (Manual for MS);
- Description of the organizational structure, management levels, functions of the structural levels, responsibilities and authorities of the managers and the interrelations in the Company;
- Description of the implementation, evaluation and improvement of the activities and processes;
- Description of the processes and their interaction.

The safe management of spent fuel (SF) and radioactive waste (RAW) has been taken as a responsibility of the Company's management in carrying out its declared policy and the management of RAW has been declared a priority in fulfilling the main objective of the Kozloduy NPP.

One of the principles of safety management in the Kozloduy NPP referred to in the strategy for the implementation of the safety policy, is strict control over the accounting of radioactive materials, which is achieved by managing all activities from the time of generation, processing, storage, transportation and their temporary storage at the site. Through a Comprehensive Program for RAW management have been regulated all stages of radioactive waste management prior to their submission, in accordance with the national and internal documents. Analysis and evaluation of the volume of RAW generated is being carried out as well as of the technological activities leading to their minimization. All activities related to radioactive waste management are carried out according to the established procedures.

The above mentioned responsibilities, priorities and objectives have been developed in the guide on the management system of the Company, the programmes for ensuring the quality of the units operating nuclear facilities and in other existing management documents such as:

- Programme for maintaining and enhancing of safety in the Kozloduy NPP in 2014, 2015 and 2016;
- Programme for Quality Assurance for the safe operation of SFSF;
- Programme for Quality Assurance. Transportation of spent nuclear fuel;
- Comprehensive Programme for management of RAW from the Kozloduy NPP.

Quality assurance in SE RAW

A management system is in force in the State Enterprise "Radioactive Waste", developed in accordance with the requirements of Standard BDS EN ISO 9001:2008 "Systems for quality management. Requirements", of the International Organization for Standardization and the safety standard of the IAEA GS-R-3:2006 "System for management of facilities and activities."

The existing system is being edified into an integrated management system based on a process approach, the baseline management system being gradually supplemented with requirements for compliance with BDS EN ISO 14001:2004 "Systems for management of the environment,

Requirements and directions for implementation" and BS OHSAS 18001:2007 "Systems for managing health and safety at work."

In all specialized divisions of the SE RAW there are programmes developed for quality assurance respectively in: operation of a facility for radioactive waste management; decommissioning of a nuclear facility; operation of a nuclear facility; working with SIR.

The activities in the Enterprise are organized into processes and are being implemented through the application of procedures and instructions, the requirements of the legislative documents being complied with, as well as the international standards and taking into account the accepted good practices in RAW management and decommissioning of nuclear facilities.

Quality assurance in the execution of a specific project, stage of a project, etc.. is ensured through the development and implementation of programmes, plans and schedules, taking into account the requirements of BDS EN ISO 10006:2003 for project management. Quality assurance of products, activities and services are based on the monitoring of indicators, data analysis, use of mechanisms for control of the data and documents, testing and measurement and others.

The management system provides mechanisms for carrying out independent evaluations, self-assessments, inspections and audits, the stages of planning, implementation, inspection and operation being implemented.

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."

Brief overview of the information presented in the previous reports

In the previous national reports the legislative and regulatory framework in the field of radiation protection in the Republic of Bulgaria were presented, in which are applied the internationally recognized principles of justification of practices, optimization of radiation exposure and establishing limits of the exposure doses.

The general requirements towards the licensees and permit holders and the fundamental principles, standards and rules for ensuring radiation protection which have to be observed when carrying out

activities in nuclear power plants are set out in the ASUNE the *Regulation on the basic Norms of radiation protection (BNRP Regulation)* the *Regulation on ensuring the safety of nuclear facilities* and the *Regulation for radiation protection during activities with sources of ionizing radiation.* All quoted NRA regulations are published, including in English on the website of the NRA - http://www.bnra.bg/.

Amendments in the legislative basis

In 2012, the amendments to the *Regulation on BNRP* were adopted. The limits of the exposure doses for the personnel have been established, namely:

- Effective dose of 20 mSv per year;
- Annual equivalent doses in compliance with the limit of the annual effective dose: 20 mSv for the lens of the eye; 500 mSv for the skin (this limit applies to the average dose received from any area of 1 cm^2, regardless of the area of the irradiated surface); 500 mSv for the hands to the forearms, feet and ankles.
- Specific requirements have been introduced for women subjected to occupational exposure during pregnancy and lactation, for students aged 16 to 18 years, as well as in the cases of permitted increased exposure.

The limits of the exposure doses for the personnel have been established, namely:

- Annual effective dose of 1 mSv;
- Limits of the annual equivalent doses, respecting the limit of the annual effective dose for a member of the population are as follows: for the eye lens - 15 mSv, for the skin - 50 mSv (this limit applies to the average dose received from each surface with an area of 1 cm^2, regardless of the size of the irradiated surface).

Measures of dose limits are not exceeded and optimization of radiation protection

In order to implement the principle of optimization of radiation protection the *Regulation on BNRP* regulates the method for determining and justifying the dose constraints for exposure of the population from different sources.

An obligation of the operator of a nuclear facility is to implement practical approaches to maintain the radiation exposure of the personnel and the population ALARA, in fulfilment of the *Regulation on BNRP*. In connection with the implementation of these legal requirements, in the issued licences for implementing the activity, the regulatory body sets detailed conditions for management of this activity - regulation, planning, training, feedback from operating experience. Through the control on the implementation of the licence conditions has been created a practical mechanism for control over the application of these legislative requirements.

A practice of the operators of nuclear facilities is the introduction of controlling, administrative levels of the individual dose for the personnel which are below the legislative limits. These administrative levels jointly with the estimated collective dose for nuclear facilities represent important tools in the process of optimization of occupational exposure.

The established ALARA councils and the involvement of managers from all levels demonstrate the commitment of the management to the process. The result is a clear trend of decreasing of personnel exposure to stable low levels.

Measures to prevent unplanned and uncontrolled release of radioactive materials

In the *Regulation on BNRP* and *the Regulation on radiation protection during activities with sources of ionizing radiation* the measures are regulated that the licensee is required to undertake in order to prevent an unplanned and uncontrolled release of radioactive materials to the environment.

For nuclear facilities a requirement has been introduced for zoning of sites and premises where the exposure may exceed 1 mSv per year or the equivalent dose can reach one tenth of the dose limits for the eye lens, skin and limbs due to the value of the dose rate, the surface contamination or air contamination. The requirements for the organization of the flows, speed, maintaining of subpressure and air purification, the procedure for access and the control over the spreading of radioactive contamination beyond the boundaries of the zones have been set in detail.

The levels for release from regulatory control of material – general clearance and the release of metals for recycling have been established by legislation (according to the specific activity for individual radionuclides).

Pursuant to Article 10 of the *Regulation on BNRP* it is prohibited to deliberately mix and dilute radioactive material with the objective of subsequent release from control.

Measures for limiting the discharges

The permissible levels of activity for liquid and gaseous discharges have not been legislatively determined, but are approved by the NRA case by case for nuclear facilities and sites. The levels of the permitted discharges to the environment shall be determined on the basis of the dose limits for the population and are coordinated with the Minister of Health.

The dose constrains from the liquid and gaseous discharges during normal plant operation are set pursuant to the *Regulation on ensuring the safety of nuclear power plants* from all nuclear facilities throughout the site up to150 mSv/a for new nuclear facilities and up to 250 mSv/a for existing ones.

The technical specifications of the nuclear facilities of the Kozloduy NPP for the operational limits and conditions of operation include also levels for discharge of radioactive substances to the environment during normal operation. With the introduced levels for activity for liquid and gaseous discharges, the exposure of the population is guaranteed to be below 50 mSv/a.

According to the new *Regulation on the Safety of Radioactive Waste Management* the dose constrain for the individual effective dose for the population as a result of a facility for near surface disposal of radioactive waste after its closure is 0.1 mSv/a and for a facility for disposal of RAW after its closure is 0.3 mSv/a.

A comprehensive system for monitoring of the liquid and gaseous radioactive discharges has been established. Information on the system has been presented in the previous reports under the Convention and in the Report of the Republic of Bulgaria pursuant to Art. 35 of the Euratom Treaty. The networks for radiation monitoring of the environment of the licensees have been presented as well as information on the radiation monitoring conducted by the central government institutions.

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

The system for radiation monitoring of liquid and gaseous radioactive discharges has been established to function during normal operation of nuclear facilities for management of spent fuel and radioactive waste, as well as in the case of deviations from normal operation and accidents. In such cases, the operator is required to implement the appropriate emergency procedures and/or emergency plans for mitigation and liquidation of their consequences, as it is presented in the report pursuant to Art. 25.

Operational experience following the presentation of the fourth national report

In the framework of the established licensing regime for nuclear facilities, the radiation protection is assessed through analysis of doses from external and internal exposure of the personnel and the population, received in the course of the operation of nuclear facilities and the number of persons who have received doses above the established limits; radioactive contamination of the environment; compliance with the rules and regulations for radiation protection.

The detailed information on the exposure dose of the population and of the personnel of the Kozloduy NPP and SE RAW in the course of the operation of the facilities for management of RAW presented in the previous reports, has been updated with data for the period 2011-2013.

Kozloduy NPP

<u>Exposure dose of the personnel</u>

The control over the exposure dose of the personnel from external and internal exposure is performed by a Control Centre "Personal dosimetry" accredited by the Executive Agency "Bulgarian Accreditation Service" as an Inspection Authority type C.

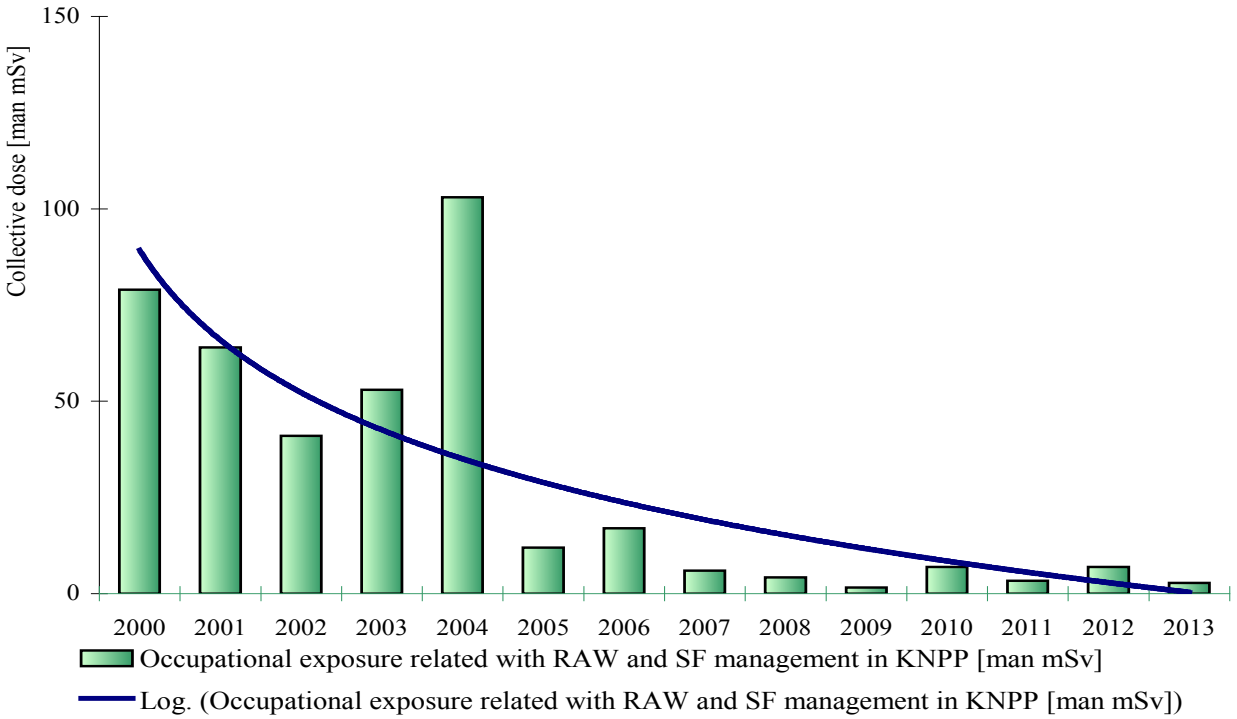
The main method of measuring the doses from external exposure is thermoluminiscent, with a threshold of sensitivity of 0.10 mSv. For the purposes of the operative dosimetric control, dosimeters are used with direct reporting with a sensitivity of 0.01 mSv.

In the process of control of the internal exposure, the method used is "in vivo", including a gamma-spectrometry measurement of the incorporated activity and a subsequent assessment of the intake and the dose using specialized software for implementing the biokinetic models of the ICRP. The level for minimum detectable activity for the whole body is 200-300 Bq for the different nuclides. The introduced level of registration of the dose during an individual measurement is 1 mSv/y from internal exposure and 0.20 mSv from external exposure pursuant to *Regulation 32 of the Ministry of Health on the conditions and order for carrying out individual dosimetric control of persons working with sources of ionizing radiation*.

For the period 2011-2013 the exposure dose of the personnel (own and on assignment) occupied with the management of SF and with the handling of RAW in the controlled areas of the Kozloduy NPP is as follows:

Year	2011		2012		2013	
	SF	RAW	SF	RAW	SF	RAW
Collective effective dose [man.mSv]	1.51	1.86	4.95	1.96	2.49	0.34
Average individual effective dose [mSv]	0.01	0.06	0.02	0.07	0.01	0.03
Maximal individual dose [mSv]	0.48	0.43	0.83	1.15	0.3	0.21

For the period 2000-2013 the collective effective dose of the personnel occupied with the management of SF and RAW in the Kozloduy NPP is as follows:



After the year 2000, the annual collective dose follows a decreasing trend and reaching levels of around 5 man.mSv in recent years. There are no violations of the dose limits, the values show a reached steady state at a sufficiently low level, which is an indicator of the degree of optimization of radiation protection in the implementation of these activities.

Discharges from the Kozloduy NPP

Summary data for gaseous and liquid discharges into the environment

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

The discharged through the ventilation stacks of the Kozloduy NPP activity for the period 2011-2013 is as follows:

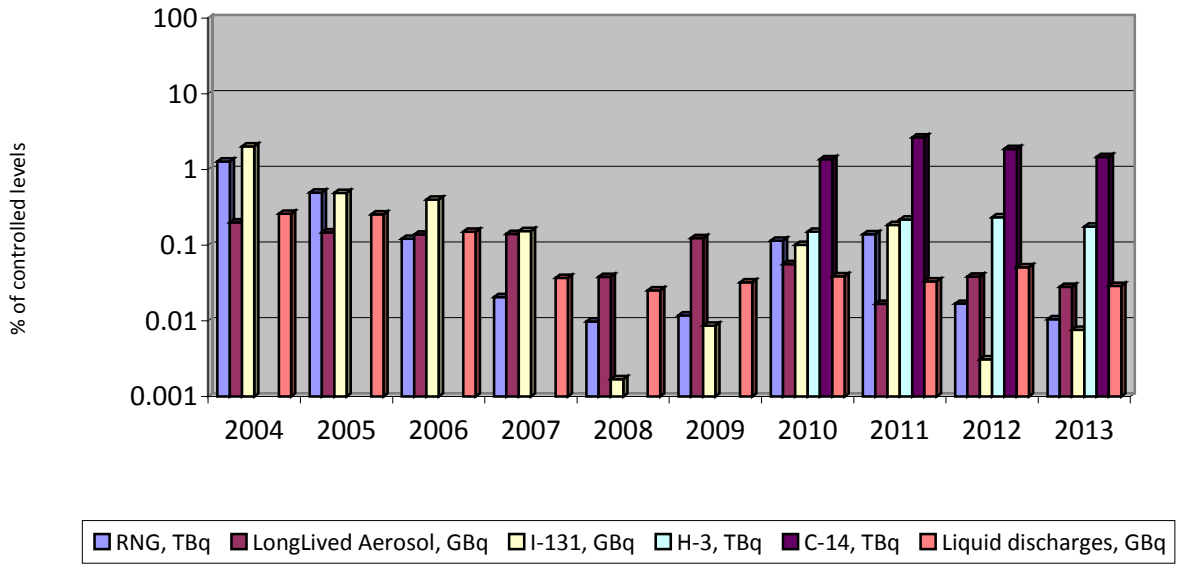
Gas/aerosol discharges	2011	2012	2013
Radioactive noble gases, TBq	9.61	0.942	0.585
^{131}I, GBq	0.0164	0.0192	0.0141
Radioactive aerosols, GBq	0.1220	0.0019	0.0049
^{3}H, GBq	0.545	0.586	0.441
^{14}C, GBq	1.010	0.710	0.557

In the period 2011-2013 in the Danube river the liquid discharges are as follows:

Year	2011	2012	2013
Activity, MBq *(without ^{3}H)*	420	411	214
^{3}H, GBq	22 900	24 100	20 700

The registered discharges of tritium in the last three years are less than 15% of the allowed amount. The discharged with the liquid emissions to the environment activity (without tritium) is kept consistently at the reached low level.

For the period 2004 - 2013, the total activity of the gaseous aerosol and liquid discharges as part of the annual controlled levels in % is as follows:



The discharged by the Kozloduy NPP radioactivity through the gaseous and liquid discharges is compatible to the usual practices in other countries operating nuclear reactors of the WWER type.

Because of the fact that SD RAW - Kozloduy is located on the site of the Kozloduy NPP, the generated by its activity liquid and gaseous discharges are released into the environment through the facilities in the plant and are registered as a total, and the information about the measured values is included in the reports on the total discharges of the Kozloduy NPP site.

Assessment of the radiation exposure of the population from liquid and gaseous discharges

For assessing the additional exposure of the population caused by the radioactive emissions into the environment, are used verified and validated models and codes, based on the adopted by the European Union (EU) CREAM methodology, adapted to the respective geographical and hydrological characteristics of the area of the Kozloduy NPP.

The additional exposure of the population in the 30 km zone is about 500 times lower than what is received from the gamma background (2,400 μSv). For the period 2011 - 2013 the values of the maximum individual effective dose for the population is less than 3 μSv/a.

The values of the maximum individual dose from gaseous discharges from the Kozloduy NPP site, taking into account the contribution of ^{3}H and ^{14}C are as follows:

Gaseous discharges	
Year	Individual effective dose [Sv]
2011	1.10^{-8} - 2.10^{-6}
2012	1.10^{-8} - 1.10^{-6}
2013	1.10^{-8} - 8.10^{-7}

The results from the exposure dose of the population from liquid discharges as per years are as follows:

Liquid discharges		
Year	Individual effective dose	
	Max. 30 km zone [Sv]	Critical group [Sv]
2011	6.10^{-7}	4.10^{-6}
2012	6.10^{-7}	4.10^{-6}
2013	5.10^{-7}	3.10^{-6}

The maximum individual effective dose for 2012 in the 30 km zone is 6.10^{-7} Sv/a, and for a representative of the critical group of the population along the Danube river is respectively 4.10^{-6} Sv/a and represents 9% of the dose limit for liquid discharges (0.05 mSv/a).

The low levels of radioactive discharges from the Kozloduy NPP set values for exposure dose of a negligible radiation risk to the population in the area of the plant.

SE RAW

Exposure dose of the personnel

In the period 2011-2013, there is no exceeding of the legislative and administrative limits for occupational exposure. There are no registered intakes of radionuclides for the personnel as a result of the activities of waste management in the SE RAW-Kozloduy. During the reporting period, the exposure of the personnel has been maintained at a level well below the dose limits for occupational exposure.

The maximum annual individual effective dose in recent years has been 1.9 mSv for the SD RAW-Kozloduy and about 2 mSv for SD RAW - Novi Han, which is about 10% of the annual limit for occupational exposure pursuant to the *Regulation on BNRP*.

In the tables below is presented data on the collective effective dose, average individual dose and the maximum individual doses for the personnel of SE RAW for the period 2011-2013 showing a clear trend for optimization of occupational exposure.

Occupational exposure at SD RAW-Kozloduy

Year	2011	2012	2013
Collective effective dose [man.mSv]	17.2	11.59	3.11
Average individual effective dose [mSv]	0.11	0.07	0.02
Maximal individual dose [mSv]	1.91	1.52	0.44

Occupational exposure at SD RAW-Novi han

Year	2011	2012	2013
Collective effective dose [man.mSv]	2.88	3.61	2.4
Average individual effective dose [mSv]	0.05	0.06	0.04
Maximal individual dose [mSv]	2.01	1.2	0.25

Radioactive discharges to the environment from the facilities of SE RAW

There are no direct gaseous and liquid discharges from the SD RAW - Kozloduy into the environment. Their separation is carried out through the respective facilities of the Kozloduy NPP and is included in the reports on emissions from the power plant.

Technologically from the SD RAW Processing Plant no radioactive noble gases, short-lived aerosols and ^{131}I are discharged. The share of the facility for waste management in the gaseous aerosol discharges from the site is less than 0.1% at full load of the facilities. The doses of the population resulting from the operation of the facilities of SD RAW - Kozloduy are included in assessing the overall radiological impact on the population from all facilities on the site.

The analysis of the results from the monitoring of the sites of SD RAW-Kozloduy shows that the radiation impact upon the site of the nuclear facility and the Kozloduy NPP site as a result of the management of radioactive waste is negligible. No unacceptable impacts upon the environment have been detected.

A monthly own radiation monitoring is held in the SD RAW Novi Han including the measurement of: water samples from the control wells; soil and plant samples from the radiation protection and the surveillance zones; gaseous aerosol measurements at the site where the waste is received.

The operation of the nuclear facility is in accordance with the legislative requirements. There is no violation of the dose limits, the values show a reached steady state at an acceptably low level, which is an indicator of the degree of optimization of radiation protection in the course of implementation of the activities of management of SF and RAW.

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 overview of the information presented within the previous national reports

The emergency preparedness in case of a nuclear or radiological emergency in the Republic of Bulgaria is part of the general national organizational measures for protection in case of disasters. The basic legislative and regulatory requirements for the structure and organization of emergency preparedness are defined in the Act on Disaster Protection (ADP), the Act on the Safe Use of Nuclear Energy (ASUNE), the Act on the Ministry of Interior (AMI) and the *Regulation on emergency planning and emergency preparedness in case of a nuclear and radiation accident*.

The ASUNE regulates the requirements for maintaining on-site emergency plans of nuclear facilities and off-site emergency plans at a national level. The plans contain the obligations of the operators and the competent state authorities in the licensing process, the organization established for emergency planning and preparedness and the requirements for periodic inspection of the plans.

The persons who engage in the management of RAW and SF are obliged to undertake measures to prevent incidents and accidents and to limit and mitigate the consequences thereof. The emergency response measures are determined by the emergency plans:

- Off-site emergency plan - to protect the population, which regulates emergency planning zones and determines the actions of the competent authorities for protection of the population, property and the environment in case of an accident;
- On-site emergency plan – of the nuclear facility, which determine the actions of the licensee for mitigation of the accident and liquidation of the consequences thereof in accordance with the off-site emergency plan.

The *Regulation on emergency planning and emergency preparedness in case of a nuclear and radiation accident* determines the principles, procedures and criteria for the application of protective measures and actions to limit, reduce, and prevent the exposure or the possibility for exposure. The intervention levels are specified as values of the estimated dose and the preventable dose for a certain period of time, the dose rate and the specific activity upon reaching of which the implementation of protective measures should start and an analysis is made of the reasons that have led to their reaching.

Information has been provided also on the existing on-site and off-site emergency plans, on the conducted in the period 1996 - 2011 г. emergency exercises and on the participation of our country in international projects on emergency planning.

The basic principles of the Act on Disaster Protection have been presented too.

The systems for emergency planning and preparedness of nuclear facilities have been reviewed and information on the conducted emergency exercises has been provided.

Amendments in the Legislative basis

The last updating of the ADP is of June 2014. The ADP establishes at a national level a unified approach and organization towards planning, maintaining of emergency preparedness and response in case of disaster, including incidents and accidents that have occurred in the management of SF and RAW. The act has been harmonized with the Act on the Safe Use of Nuclear Energy (ASUNE)

regarding the requirements for the development of emergency plans, their contents, the necessary human resources, material and technical support and others.

The protection in case of disasters is carried out at national, regional and municipal level. The National Emergency Plan regulates in detail the duties, responsibilities and rights of competencies at each level.

The main component of the Unified Rescue System (URS) are the General Directorate "Fire Safety and Protection of Population" within the Ministry of Interior, the regional directorates of the MI and the centres for emergency medical help. The structure of the URS is edified throughout the country in accordance with the administrative and territorial division. The other components of the URS - executive bodies, legal entities, centres for emergency medical treatment, other health care facilities and others, provide assistance at the request of the Ministry of Interior, according to their departmental plans for conducting rescue and immediate emergency repair work.

The Ministry of Interior develops a National Emergency Plan, which is adopted by a decision of the Council of Ministers. The last update of the National Emergency Plan was approved by a Decision № 973 of the Council of Ministers dated December 29, 2010. The development and maintaining of the plan and the application of protective measures are financed from the state budget.

Emergency plans on the sites of nuclear facilities

The emergency plans of all nuclear facilities for management of SF and RAW are being maintained:

- Emergency Plan of the Kozloduy NPP, version 2013. It includes the nuclear facilities in operation, the facilities for management of SF on the site (SFP, SFSF and DSFSF) and takes into account also the facilities of the SE RAW located at the site of the Kozloduy NPP;
- Emergency Plan of SD RAW - Kozloduy, version 2008.
- On-site emergency plan of the SD "Decommissioning", version 2013;
- On-site emergency plan of the SD "Management of RAW - Units 3 and 4," version 2012;
- Emergency Plan of SD RAW - Novi Han, version 2011;
- Plan for eliminating the consequences and protection of the population and the environment in case of a radiation accident during transportation of spent nuclear fuel, version 2011;

The plans have been tested during exercises.

Emergency exercises and drills

For the implementation of the off-site emergency plan emergency drills and full-scale emergency exercises are carried out at least once every five years.

In May 2009, a full-scale national exercise for response in case of an accident at the Kozloduy NPP was conducted. The preparedness for response and the implementation of protective measures was checked, as well as the coordination between the institutions and the interaction with the media in informing the population in case of an accident with possible radiological consequences. As part of the exercise were conducted practical exercises and demonstrations of the implementation of protective measures in the emergency planning zone around the Kozloduy NPP. For November 2014 is planned the implementation of the next full-scale national exercise.

The Republic of Bulgaria actively participates in international emergency exercises and drills for action in case of a nuclear and radiological emergency. In the period 2008 - 2013 the country took part in eighteen national and international exercises and drills.

In the framework of the "Regional Programme for Excellence - Safe Nuclear Energy" part of the Norwegian Cooperation Programme with the Republic of Bulgaria for economic growth and sustainable development, the NRA organized two training courses on "Development,

implementation and evaluation of exercises for action in case of a nuclear or radiological emergency" and "Actions taken by the initially reactive entities (rescue) in case of a nuclear or radiological accident" for officials from the Nuclear Regulatory Agency, Ministry of Interior (civil protection and fire safety), the Ministry of Health, Ministry of Environment and Water and the Kozloduy NPP. Within the same programme in 2011 was conducted a joint Bulgarian-Romanian exercise for response in case of accidents involving the transport of spent nuclear fuel.

Regulatory inspections on emergency preparedness

The NRA implements ongoing control of the state of emergency planning and preparedness of the operators of nuclear facilities in accordance with the annual inspection plan for the control activity. A review is performed over the following, namely:

- Procedures and instructions for the assessment of the emergency situation and undertaking of protective measures;
- The state of the emergency equipment and the protective means of the members of the emergency team, of the centres for accident management;
- The conducting of emergency drills and exercises – performance, analysis, 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 overview of the information presented in previous reports

The basic requirements of the ASUNE and the regulations in force on its implementation in the field of decommissioning of nuclear facilities are presented.

The existing licensing regime for decommissioning of nuclear facilities has been presented, and in particular the two basic legislative documents – the *Regulation on the Procedure for Issuing Licences and Permits for Safe Use of Nuclear Energy* and the *Regulation on safety during decommissioning of nuclear facilities*, which contain requirements related to the process of decommissioning on the course of the licensing process for the stages of the life cycle of nuclear facilities.

The strategy for decommissioning the shutdown units of Kozloduy NPP and the subsequent update of the strategy have been presented too. Comprehensive information is presented on the course of the preparatory activities for decommissioning: radiological investigation of the nuclear facilities for the purpose of planning of decommissioning; development of key documents related to decommissioning – Plan for decommissioning, SAR, EIA report; the implementation of engineering projects related to the clearing of nuclear facilities from non-processed historical RAW and with the provision of the necessary methodological and technical means to carry out dismantling activities, decontamination and waste management. Information is provided on the movement of financial resources in the decommissioning fund and on the amount and sources of funding of the preparatory activities for decommissioning.

The amendments to the ASUNE in 2010 have introduced the requirement for issuing a license for decommissioning, which has removed the double authorization regime. The keeping of the condition that the responsibility lies within the licensee in respect to the safety of the facility throughout the whole period of decommissioning, is ensured and the necessity for the entity carrying out the decommissioning to be the operator of this nuclear facility is avoided. The license for decommissioning shall be issued for a period of 10 years.

For the implementation of the concept of release from regulatory control, a mechanism has been introduced, where clearance of material is not subject to a separate authorization process and any specific clearance is approved by the Chairman of the NRA.

Amendments in the legislative framework related to decommissioning of nuclear facilities

During the past period there have been no changes in the legislative framework related to decommissioning of nuclear facilities.

Personnel and financial resources

The availability of adequate human and financial resources for decommissioning is a legal requirement under the ASUNE. The basis for planning the resources is the cost estimates for decommissioning. On this basis the NRA must obtain conclusive evidence that the ensured financial resources are sufficient for the implementation of the decommissioning plans.

The cost estimates shall be prepared by the licensee at the earliest possible stage (design of nuclear facilities) in the preliminary planning for decommissioning. The preliminary plan for decommissioning is the basic document that needs to be presented to the NRA together with the application for a license to operate. The periodic updating of the estimated cost of decommissioning is a requirement to the operator at each updating of the plan for decommissioning of nuclear facilities.

The fund "Decommissioning of Nuclear Facilities" to the Minister of Economy and Energy was created to finance the activities on decommissioning of nuclear facilities. The main revenue contributions originate from nuclear facility operators. The amount of the contribution is determined in such a way so that at the end of the operational period, the necessary funds to cover the costs of decommissioning can be accrued.

The mechanism for determining the amount of contributions in order to accumulate the necessary funds to finance the activities is defined legislatively by the *Regulation on the procedure for assessment, collection, spending and control of the funds and the amount of contributions due to the Fund "Decommissioning of Nuclear Facilities"*.

The cost estimates of decommissioning includes the subsidizing of the personnel, including training and drills.

Pursuant to the ASUNE, the activities in nuclear facilities and with sources of ionizing radiation, which have an impact on safety, can only be carried out by professionally qualified staff with a certificate of competency. The conditions and order for acquiring professional qualification, the positions for which it is required and the carrying out of examinations are set out in a separate *Regulation on the terms and conditions for acquiring professional qualification and the procedure for the issuance of licenses for specialized training and certificates for qualification for the use of nuclear energy*.

Information on the available qualified personnel is presented in the report pursuant to Art. 22.

Radiation Protection

Pursuant to Art. 20 of the *Regulation on the safety of the decommissioning of nuclear installations*, the radiation protection in the process of decommissioning of a nuclear facility is implemented in accordance with the principles and standards pursuant to the *Regulation on BNRP*. For ensuring the radiation protection during activities on the decommissioning of a nuclear facility, the licensee shall

develop in the framework of the plan for decommissioning a concept and programmes for radiation protection of the personnel, population and the environment.

The removal of the physical barriers in the process of dismantling of the nuclear facility, that restrict the spreading of radioactive substances in the environment, is performed only on the condition that the liquid and gaseous discharges will not exceed the prescribed values for permitted discharges for the period of work on decommissioning.

The *Regulation on BNRP*, the *Regulation on ensuring the safety of nuclear facilities* and the *Regulation on radiation protection during activities with SIR*, which are applied also in the process of decommissioning of nuclear facilities, have delineated in detail the provisions of art. 24 of the Convention pertaining to the dose limits and restrictions on the personnel and the population, including as a result of authorized radioactive discharges.

Emergency Planning

The provisions of the ASUNE and the *Regulation on emergency planning and emergency preparedness in case of a nuclear or radiological emergency* which are in relation to the implementation into the national legislation of the provisions of Art. 25 of the Convention shall apply to any nuclear facility, including one in a stage of decommissioning.

For the purpose of issuing a license for decommissioning of a nuclear facility, the applicant is required under the *Regulation for safety in decommissioning of nuclear facilities* to submit to the NRA an on-site emergency plan for preparedness and action to protect the personnel, the population and the environment in the event of a radiological accident. The on-site emergency plan is developed based on the analysis of the possible emergency events and their consequences, taking into account the current state of the nuclear facility, of its systems and its facilities important to safety, and the envisaged in the plan activities on decommissioning and the technical and organizational measures to ensure safety. The on-site emergency plan is developed under conditions and according to procedures specified by the *Regulation on emergency planning and emergency preparedness in case of a nuclear or radiological emergency*.

Storage of information important to decommissioning

Pursuant to Article 33 of the *Regulation on safety of decommissioning of nuclear facilities*, the licensee shall develop a programme on quality for the respective stage of decommissioning.

For the stages design and construction, commissioning, operation and during the period of decommissioning, the holder of the respective permit or the licensee shall collect, process, distribute and store documents and information related to the planning for decommissioning and with the carried out activities on the decommissioning of the nuclear facility. The scope of the stored information important to decommissioning covers the full project documentation and the relevant design modifications pertaining to the reconstruction and modernization during the operation, as well as the whole service records. All this documentation is provided to the operator of a nuclear facility for decommissioning and is stored by that operator.

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 in the previous National Reports.

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

The requirements of the Environmental Protection Act regarding the implementation of Environmental Impact Assessment (EIA) of investment proposals concerning SF management are described. In the process of EIA preparation, biological, chemical and other risks are considered.

The reports present the measures that the Republic of Bulgaria envisages in order to ensure the reducing of the radiation impact at the Kozloduy NPP site and to avoid the imposing of undue burden on future generations.

A detailed review is given of the *Regulation for 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 fulfilment of the responsibilities under article 4 of the Convention.

It is pointed out that the main safety functions – ensuring of subcriticality and residual heat removal are ensured by the design of the SF management facilities. For maintaining subcriticality during normal operation and in case of design basis accident, the effective neutron multiplication factor should be less than 0.95. The burn-up can be used as a parameter for the nuclear safety justification only in case that the control of the burn-up of the spent fuel entering the SF facilities is realized through technical means.

The design of the SF management facilities envisions technical means and organizational measures that prevent a temperature rise in the spent fuel elements cladding above the design limits for normal operation and in case of design basis accidents.

Consideration is given to the regulatory requirements towards the technological processes for SF management and pre-processing which should be so designed that the RAW quantities are minimal. The design shall ensure limitation of the volume and activity of the liquid RAW to a level as low as

reasonably achievable. The RAW management systems are designed taking into account the requirements for the safe SF management throughout the entire lifetime of the facility. It is highlighted that the RAW minimization principle during SF management has also been adopted in the National Strategy for management of SF and radioactive waste.

It is stated that, according to the ASUNE and the regulations on its implementation, for the purpose of SF management, the exposure of the personnel and the population has to be kept as low as reasonably achievable. The effective protection of the personnel, the population and the environment is ensured by applying the defence in depth principle through establishing a system of physical barriers along the pathways of ionizing radiation in the environment and a system of technical and organizational measures for protection of the barriers and maintaining their effective performance.

The reports present the regulatory requirements regarding the annual individual effective dose limits for internal and external exposure of the public caused by liquid and gaseous releases to the environment from SF management facilities and also from releases resulting from design-basis and beyond design-basis accidents. The constructions and technologies involved in maintaining the subcriticality and used for residual heat removal in the SF pools 1-6 and WSFSF have been described.

It is pointed out that, according to the legislative requirements, the design has to limit the liquid RAW volume and activity to as low as reasonably achievable levels through efficient purification 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 measures.

Information has been presented regarding regulatory requirements for:

- Considering the interdependence of the different SF management stages;
- Protection of the individuals, public, environment and future generations;

The main principles of the Strategy for SF and RAW Management until 2030 adopted by the Council of Ministers in January 2011 are presented with regard of: minimization of the accumulated RAW; providing of efficient protection of the individuals, the population and the environment; avoiding actions that impose predictable consequences for future generations, exceeding those deemed acceptable for the current generation and avoidance of the imposing of undue burden on future generations.

Changes in the legislation and regulatory basis

In August 2013 the Council of Ministers adopted the *Regulation for safety of spent fuel management* which introduces the main principles in the spent fuel management as follows: minimization of RAW generation; passive safety; applying of graded approach; ensuring of subcriticality and residual heat removal; maintaining the impact of the ionizing radiation on the personnel, the population and the environment at a level as low as reasonably achievable. Changes have been made to bring the provisions of the Regulation in accordance with the reference levels for safe SF management adopted by WENRA.

According to the legislative changes, the licensee has to ensure:

1. Generation of RAW at the practical minimum in terms of activity and volume through appropriate design solutions and operational and decommissioning practices including recycling and re-use of materials.
2. Safe management of the SF, including long-term storage using passive safety principles.
3. Implementation of all measures according to a graded approach;
4. Sufficient subcriticality and residual heat removal;

5. Maintaining the impact of ionizing radiation at the minimal reasonably achievable level;
6. Applying a justified and documented process of decision making at every stage of the SF management;
7. Operation of the facilities and carrying out the activities on SF management using documented and approved limits and operational conditions;
8. Taking into account the interrelations between all stages of generation and management of SF;
9. Application of criteria for SF acceptance;
10. Traceability of SF at each stage of the management.

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

Information about the RAW, generated from the SF management at the SFSF and the respective trends, is presented in Section H of this Report under Article 11 of the Convention. This section also presents summarized information about the generated RAW and the respective trends for units 1-6 of the Kozloduy NPP (it cannot be specified what part of the RAW is generated from SF management and what – as a result from units operation).

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 previous National Reports

An Annex provides a description of the SF management facilities that have been available at the time the Convention entered into force. Information is presented about the performed and the planned safety analyses of the SFSF and the reactor pools at the KNPP.

The transitional provisions of the *Regulation for safety of spent fuel management* are presented regarding modifications resulting in changes in structures, systems and components important to safety and located in the SF management facilities, that had been commissioned prior to the Regulation entering in force. It is stated that for the existing SF management facilities the provisions of the regulation are applied to the maximal extent.

Information is provided about the safety assessments and safety improvement of the existing facilities.

Detailed information is provided about the following activities performed in the WSFSF, namely "accelerated corrosion tests", evaluation of the conditions of the construction materials of the pools lining and the transport storage baskets, and analysis to determine the lifetime of the SFSF building and equipment.

The results from the safety review of the reactor pools 5&6, conducted within the framework of SAR updating after the modernization of the respective units, are presented.

The results from the "*Analysis and safety assessment of the operations in the existing WSFSF, related to the DSFSF project*" are presented.

Safety reviews and safety enhancements of existing facilities

Immediately after the Fukushima accident, the Bulgarian Government initiated emergency measures for revising the preparedness of the Kozloduy NPP to react in case of an emergency. Following the NRA instructions and in accordance with the WANO recommendations, the Kozloduy NPP conducted and, by the middle of July 2011, completed the "*Programme for review and assessment of the preparedness of Kozloduy NPP to manage and mitigate the consequences of beyond design basis accidents, external and internal impacts"*. Within the Programme framework, a large volume of additional inspections of the availability have been conducted and assessment has been done of the technical condition of safety significant structures, systems and components, availability and applicability of instructions and procedures, as well as of the preparedness of the personnel to respond to emergency situations. In the beginning of 2012, the Kozloduy NPP developed and introduced the "*Programme for Implementation of Recommendations following the Stress Tests carried out on Nuclear Facilities at KNPP*". In the end of December 2012, the National action plan of Bulgaria was submitted to the EC. In this respect, the NRA required that, at the end of 2013 the Kozloduy NPP presents a summarized periodic report regarding the status of the measures on the National Action Plan and update of the "Programme for Implementation of Recommendations following the Stress Tests carried out on Nuclear Facilities at KNPP"

Within the framework of the National Action Plan, the following measures have been implemented to improve the safety of the SF management facilities:

- Measure C-2-2. Power supply for the heat removal systems or SFP filling using the mobile diesel generator, completed in 2014;
- Measure FC-2-4-1. Installation of an independent cooling system in the WSFSF, in progress with deadline December 2015;
- Measure FD-2-4-1. Installation of an additional pipeline to the cooling system of SFP 5 and 6, ensuring redundancy through an external source. In progress, with deadline November 2014;
- Measure FD-2-5-1. Construction of a pipeline for direct water supply for the pool in the WSFSF from an external source (diesel fire pumps or fire vehicle), in progress, with deadline June 2015.

Detailed information about the conducted stress tests, as well as about the fulfilled and planned measures for the safety improvement is provided in the National Action Plan, published on the NRA web site on http://www.bnra.bg/en/nuclear-facilitie/stress-tests/kozloduy/nacp-bg-rev.-jan-2014-en.pdf.

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 in the previous National Reports

The reports describe the requirements set in the *Regulation for safety of spent fuel management* and the *Regulation on the Procedure for Issuing Licences and Permits for Safe Use of Nuclear Energy* regarding the site selection for SF management facilities. It is pointed out that in the process of selection of sites for SF management facilities it is necessary to study and assess the site characteristics that may affect the safety of the facilities, and the effect of the SF management facilities on the population (now and in the future) and the environment. A list is provided of the documents that the applicant is required to submit along with the application for issuance of a site selection permit and for issuance of the site approval order. The data is identified that need to be included in the preliminary safety analysis report which should be a part of the application package for issuance of the site approval order. It is also indicated 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 of the other nuclear facilities built on the same site on the safety of the proposed new facility as well.

The reports describe the requirements of the *EIA* regarding the public hearing on the EIA results organized jointly by the municipal authorities and the competent body that issues the decision on the EIA. The order of implementation of EIA is described, as regulated in the *Regulation about the environmental impact assessment of investment proposals for construction, activities and technologies*. The competent authority for the decision making on the EIA is the Minister of the Environment and Water. The decision on the EIA is made on the grounds of the prepared environmental impact assessment, the results from the conducted consultations and public hearing, and in compliance with the legislation in force. If necessary, the decision contains measures for mitigation or preventing the negative impacts on the environment formulated as a Plan and being obligatory for implementation by the investor/operator during the designing, construction, operation and the eventual shutdown of the installation/facility.

The reports present 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 that may cause a significant environmental impact on their territory.

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

Information has been provided about:

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

It is indicated that the *Strategy for SF and RAW Management until 2030*, adopted in January 2011, prescribes implementation of measures for:

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

Issued permits for site selection and site approval orders for SF management facilities

In the period following the Fourth National Report, no permits for site selection or site approval orders for SF management facilities have been issued.

Changes in the legislation and regulatory basis

In the period following the Fourth National Report, no changes have been made in the legislation or regulatory basis regarding site selection for SF management facilities.

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 presented in the previous national reports

A description of the requirements of the *Regulation for safety of spent fuel management* and *the Regulation on safety during decommissioning of nuclear facilities* concerning the design and construction of the SF management facilities is provided.

It is pointed out that the safety of the spent fuel management facility is provided through:

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

It is stated that the project of the SF management facilities should include a preliminary SAR for normal operation and for the cases of design basis and beyond design basis accidents. After the facility construction the SAR should be updated according to the current status.

The obligation of the Holder of the permit 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 decommissioning of the nuclear facility on the population and the environment are presented.

Detailed technical information is given, regarding the construction of the DSFSF on the Kozloduy NPP site. Some of the most important conditions of the technical design approval order for the DSFSF and the construction permit for the DSFSF, issued by the NRA Chairman are presented.

The conditions of the permit issued for the construction of the Belene NPP, units 1 and 2 are also presented.

Information is given about the progress in the construction of the DSFSF and its forthcoming commissioning.

Designed and constructed facilities

DSFSF at the Kozloduy NPP site

The construction of the DSFSF was completed in the period after the submission of the Fourth National Report.

Information about the issued permit for the DSFSF commissioning is given in this Report under Article 9 of the Convention.

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 previous national reports

The requirements of the *Regulation for safety of spent fuel management* and *Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy* regarding safety assessment of SF management facilities are described. It is pointed out that the safety analysis is a main responsibility of the licensee and that the projects for SF management facilities should include preliminary safety assessment reports. Information concerning the conducting of environmental impact assessment is also presented.

It is stated that the project of the SF management facilities should include a preliminary SAR, which should be updated according to its current status, after the facility has been constructed. 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 life time and in the period of decommissioning.

The most important requirements to the content of the preliminary SAR, which is submitted with the request for issuing of an approval order of the selected site for the nuclear facility, are reviewed. It is pointed out that it is obligatory to attach the decision according to chapter 6 of the Environmental Protection Act to the request for approval of the selected site for the 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 a nuclear facility.

The main stages of review and assessment of SAR, according to the national legislation and internal NRA regulations, are presented. The main results are presented from the ISAR review and assessment, conducted within the procedure for the approval of the technical design of the DSFSF.

Changes in the legislation and regulatory basis

In August 2013, the Council of Ministers adopted changes in the *Regulation for providing safety of spent nuclear fuel*. The changes introduce more strict requirements to the SAR and its updating.

According to the Regulation, the SAR should reflect the physical conditions of the facilities throughout their lifetime and in the period of decommissioning and to consider the safety aspects in regard with:

1. site

2. design
3. construction
4. operation
5. decommissioning

According to the Regulation, SAR should be updated with regard of:

1. changes in the design or operational practices;
2. changes in the legislation or safety requirements;
3. results of the regular safety assessments;
4. results from analyses of events;
5. any new information concerning safety

Safety reviews and safety reports assessments

WSFSF

According to the *Regulation on the Procedure for Issuing Licenses and Permits for Safe Use of Nuclear Energy*, for the renewal of the operational license, the Applicant is required to submit in the NRA an updated safety assessment report with the following aspects taken into account: regulations in force; actual condition of the nuclear facility; planned service life; current analytical methods, own and international operational experience and the latest achievements of science and technology.

In the period following the presentation of the Fourth National Report, the NRA carried out a review of the Modification/addition to the Safety Analysis of the WSFSF and the periodic Safety Analysis Report of the WSFSF, submitted by Kozloduy NPP in connection with the WSFSF operational license renewal.

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 in the previous national reports

The reports present information on the requirements of the ASUNE regarding the issuance of an operational license 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 Issuing Licenses and Permits for 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 shall be attached to the application for issuance of a commissioning permit for a nuclear facility.

It is noted that the operational license is issued to a nuclear facility only after the conditions of the permit for nuclear facility commissioning have been fulfilled, confirmed by a commission of NRA inspectors, appointed by an order of the NRA Chairman after reviewing the submitted documents and conducting an on-site inspection. A list of the documents is presented that have to be submitted together with the application for issuance of an operational license for a nuclear facility.

It is noted that the Technical Specifications for operation which include the operating limits and conditions shall be compiled on the basis of the design of the facilities and the preliminary SAR, and is corrected after the commissioning, after design changes, and after 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 tasks 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 as well as personnel errors. The results from the analyses are reported on a systematic basis and are applied to improve the operating practice, personnel qualification and maintenance optimization.

The reports present the Kozloduy NPP system of procedures for assessment and analyses, as well as for decision making about the corrective measures and assessment of their efficiency with regard of the operational feedback. The reported events in the SF management facilities and the implemented corrective measures were reviewed.

The modifications in the operational license for the WSFSF are presented, with regard of the preparations for the loading of CONSTOR 440/84 casks for dry storage of SF.

Operation of the SF management facilities

WSFSF

The 10 year operational license for the WSFSF was renewed in June 2014. During the process, the NRA conducted a review of the submitted documents including:

- Modification/addition to the SAR for the WSFSF;
- Periodic SAR for WSFSF;
- Periodic SAR for WSFSF with underwater storage technology;
- Updated long-term program for modernization and improvement of the WSFSF safety;
- Program for maintaining and enhancing of the safety in 2014, 2015, 2016;
- Program for fulfilment of the requirements following the stress tests conducted in connection with the Fukushima accident;
- Plan for aging management of the structures, systems and components of the WSFSF of the Kozloduy NPP.

- Report "Remaining useful life estimation of systems and equipment for SF storage and systems and lifting equipment for regime of accepting and transport of SNF to the WSFSF at the Kozloduy NPP", the actions necessary for the lifetime management program;
- Report "Remaining useful life estimation of systems and equipment for SF transport of SNF to the WSFSF at the Kozloduy NPP the actions necessary for the lifetime management program. Final report.
- Report on the implementation of the Plan for aging management of the structures, systems and components of the WSFSF at the Kozloduy NPP.
- Report on the fulfilment of the operational licence conditions for the spent nuclear fuel storage facility;
- Summary report. Analysis and safety assessment of the operation in the existing spent nuclear fuel facility (WSFSF), concerning the Dry Spent Fuel Storage Facility (DSFSF) project;
- Interim report "Review of the modifications of the SFSF design after 2003 and the impact of the modifications of the safety of the facility";
- Interim report on the "Nuclear and radiation safety categorization of the SSCs, seismic resistance and fire safety";
- Interim report "Review of the changes in the legislation of the Republic of Bulgaria and the respective changes concerning the WSFSF.

Dry Spent Fuel Facility

In March 2011 the NRA Chairman issued the Permission for DSFSF commissioning. The permission allows the Kozloduy NPP to perform the following activities in the framework of the Program for DSFSF commissioning:

- SF storage in CONSTOR 440/84 casks and their handling;
- Handling, pre-processing, processing and storage of Radioactive Wastes (RAW), resulting from the implementation of the activities to hand them over for subsequent processing
- Validation tests for the design characteristics of the nuclear facility, availability criteria and parameters of the technological process;
- Diagnostics, maintenance; repair, inspections and operational control of the structures, systems and components important to safety;
- Any other activity connected to commissioning of the spent fuel storage facility, except in cases when a special permit or license is required according to the Act for Safe Use of Nuclear Energy (ASUNE).

The activities under the permission are limited to receive and consistently place for storage in the facility of 6 CONSTOR 440/84 containers with spent fuel.

To the date of the preparation of the Report, the Programme for the commissioning of the DSFSF has been completed and all 6 CONSTOR 440/84 containers have been filled and transferred for storage in the DSFSF. The issuance of a license is forthcoming.

Reporting of events and operational experience analysis

DSFSF

In the period after the presenting of the Fourth National Report one operational event connected with spent fuel management has been reported. The event was rated as INES level 0.

On August 8, 2013 at 11:05 during the transfer of a CONSTOR 440/84 container with a bridge crane, there was a failure of main power supply in the DSFSF building. After the power had been

restored from the auxiliary diesel generator it was observed that the vertical movement of the crane was not possible. The container stayed at 3.5 m above the damper.

The inspection showed that the power loss was caused by a failure of the switch powering the DSFSF facilities, and the cause of the loss of moving ability of the crane was a defect in the frequency regulator of the crane.

At 16:00, after the defective component of the switch of the DSFSF had been replaced, the power supply was restored and the container was "manually" brought down and transferred to the storage place.

No violation of the operational limits or conditions took place. There was no change in the radiation conditions in the plant area.

In order to determine the cause of the event, the following have been performed:

- The defective frequency regulator was replaced with a new one of the same type, as specialists from the DSFSF designer were present during the procedure The same settings have been installed, as were in the defective regulator;
- Functional tests of the crane were performed, after a new frequency regulator for the control of the main lift had been installed. During the lowered speed tests, no failures were observed. During the tests with normal speed, an uncontrolled (without a command "down") descending of the load was observed; the uncontrolled descending was within 10 cm and it did not occur every time the load was taken down, but rather at random. Such uncontrolled descends were observed earlier, during the pre-commissioning tests and the problem had been solved through series of corrections of the frequency regulator parameters;
- In order to determine the cause of the event, the defective frequency regulator was sent to the manufacturer – "Siemens". The final report about the cause of the failure is to be delivered. There has been presented only an interim report so far. In the summary of the report, it is stated that the reason for the destruction of the modules of the regulator has not been determined. The modules were sent to the manufacturer for second examination. The results are expected, after the final report has been presented.
- An independent analysis of the parameterization of the frequency regulator has been performed by an external organization. Recommendations were given about the optimization of the parameters and inclusion of additional functionalities. All recommendations have been met by the Kozloduy NPP except one, due to the request from the manufacturer to the regulator.
- Tests with dynamic load 110% have been performed. The tests were successful and the crane has been commissioned.

Decommissioning plans

The development of the decommissioning plans for the SF management facilities is discussed in Section E of this Report and in the texts 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."

The Council of Ministers can declare SF as radioactive waste under the conditions, set in the ASUNE.

In the Strategy for SF and RAW Management until 2030, adopted in January 2011 by the Council of Ministers, the option for SF disposal is considered. It is pointed out that in the long term, taking

into account the European consensus; the deep geological repository is the best option that ensures long-term safety in the isolation of high-activity and long-living radioactive waste. Taking into account the geological and climatic conditions in the country, as well as the legislation, public opinion, financial capabilities and the volume of the high-activity radioactive waste, including SIR, it is concluded that the participation of the country in regional and international planned projects is appropriate. It is stated that the search for international initiatives should not imperil the ongoing 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 in the previous national reports

The previous National Reports present the basic regulatory acts that regulate the requirements in article 11 of the Convention, namely the ASUNE, EPA, and BNRP -2004.

Discussions are offered on the provisions of the ASUNE for ensuring the subcriticality of RAW management, keeping to the minimum the RAW generation and accounting for the interdependence of the different stages of RAW management. Presentation is made of the *Regulation for safety of RAW management*, *Regulation for radiation protection during activities with sources of ionizing radiation* and the *Regulation for ensuring the safety of nuclear power plants*.

Special attention is paid on the processes for ensuring of subcriticality and decay heat removal, and the technological solutions implemented to minimize RAW. The need to put more efforts for release of materials from regulatory control is highlighted.

The previous Reports present the basic regulatory acts – ASUNE, Act on Public Health and EPA, as well the regulations for their implementation for ensuring of the protection of the individuals, the population and the environment from radiological and other risks. The main changes are also discussed, adopted in connection with the more precise regulation requirements under Article 11 of the Convention.

The nuclear safety and radiation protection control is conducted by the competent authorities – NRA, Ministry of Health (The state control for compliance with the requirements for protection of individuals from the impact of ionizing radiation is conducted by Regional Inspectorates for Protection and Control of Public Health and the National Centre for Radiobiology and Radiation Protection) and the Ministry of Environment and Water in the framework of the licensing process.

The safety requirements, including the responsibilities of the licensee, are set in detail through the new *Regulation on the Safe Management of Radioactive Waste*.

Ensuring of subcriticality and residual heat removal

According to the Article 37 of the *Regulation on the Safe Management of Radioactive Waste* it is required, when necessary, that the RAW management facility project includes also design solutions for maintaining subcriticality and ensuring of the residual heat removal.

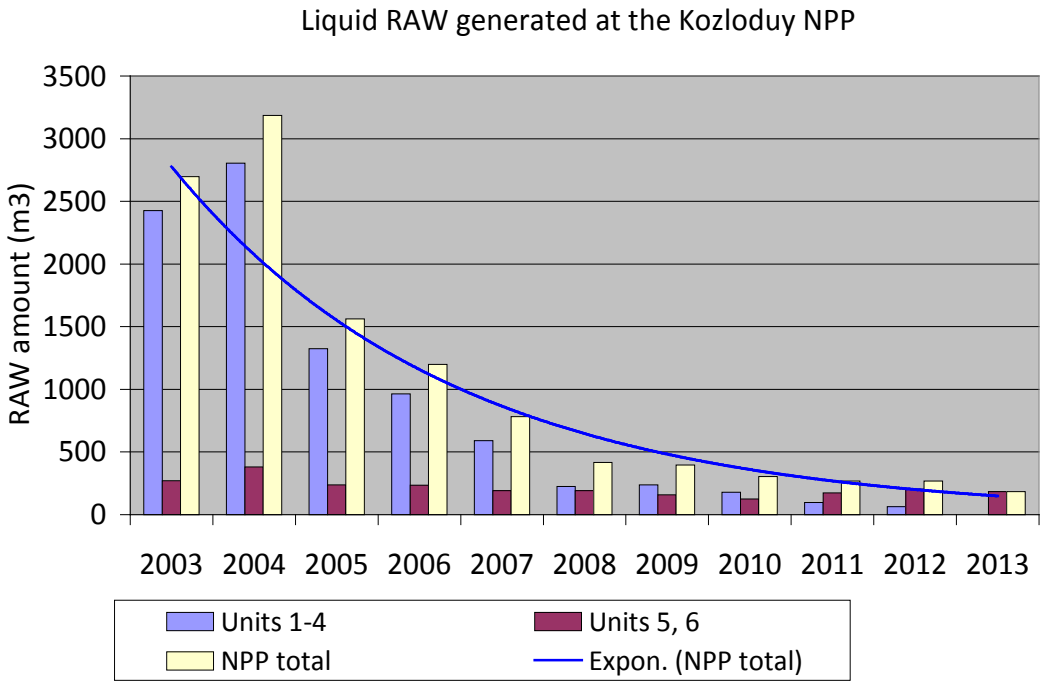
Both the existing and planned facilities for RAW management activities in Bulgaria do not require special measures for maintaining subcriticality and ensuring of the residual heat removal. This is justified in the respective safety reposts and assessed during the licensing process. The control is also performed through the licensing regime when modifications important to safety are introduced in the design of nuclear facilities. In the cases, when RAW is fissile material, the national legislation on spent fuel is also applicable.

RAW minimization

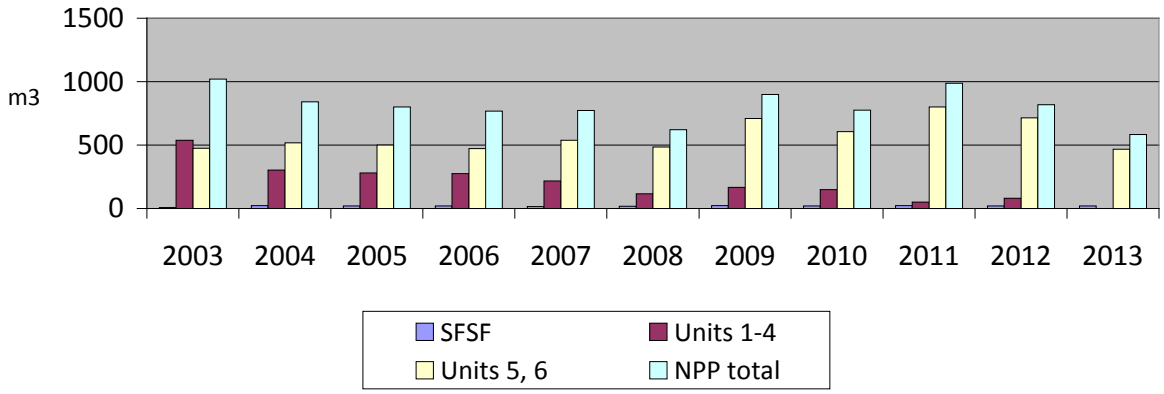
The requirement for the minimization of RAW from permitted activities is set in the ASUNE and given in detail in Article 10 and 11 of the *Regulation on the Safe Management of Radioactive Waste*. The reduction of the generation of RAW at the source of their generation has higher priority than the measures for the reduction of the amount and activity of RAW during their subsequent management. It is realized through:

- The requirements for RAW minimization should be taken into account at the stages: design, construction, operation, and decommissioning of the nuclear facility
- The compliance of the operational practice at the nuclear facility with the regulation requirements shall be confirmed by the regulatory body through the mechanisms of preventive, current and subsequent control in the licensing process.

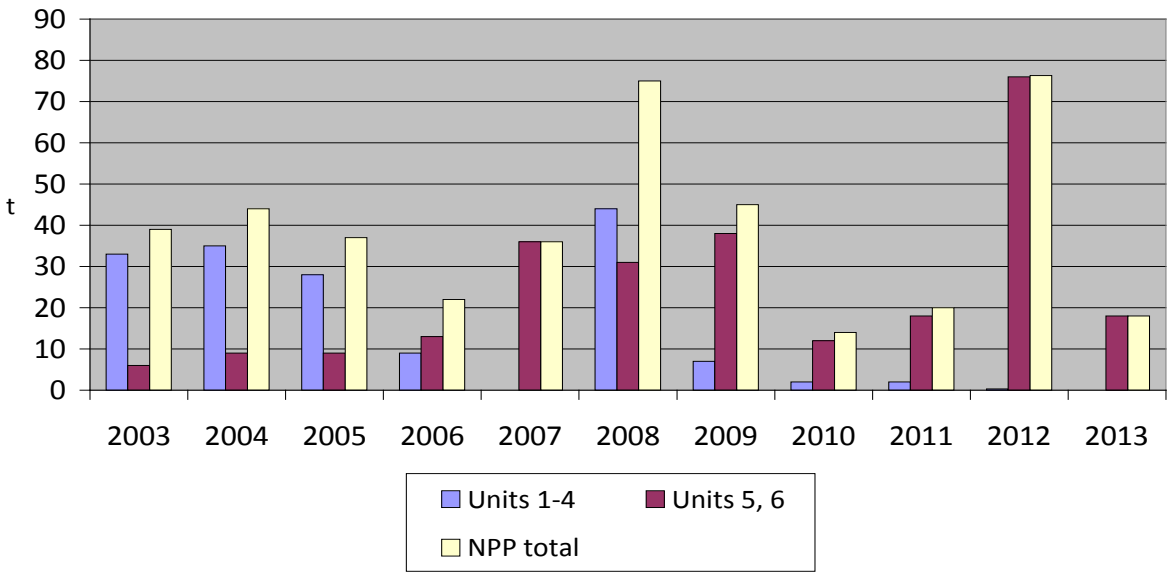
An indicator of the implementation of the requirements for RAW minimization is the data for the period 2003-2013 presented in the following table. These data show that an acceptable stable level of RAW amount form the Kozloduy NPP operation has been achieved.



Compactable RAW generated at the Kozloduy NPP



Non-compactable solid RAW generated at the Kozloduy NPP



After the shutdown of units 1-4, the amount of the generated RAW has decreased drastically. In the units 5 and 6 in operation, a consistent policy for decreasing of liquid RAW generation has been implemented. Generally, the trend of decreasing the liquid RAW generated at the Kozloduy NPP has been maintained.

As a result of the measures, implemented for RAW minimization, the capacity of the existing RAW management facilities is sufficient for their processing along with the historical RAW. In the period 2011-2013 the amount of the processed RAW significantly surpassed those generated in the Kozloduy NPP. As a result, the amount of the unprocessed RAW, stored at the Kozloduy NPP site, has decreased.

Together with the limitation of the generated RAW, attention is paid to the requirements for minimization of the RAW intended for disposal, through the application of special methods for treatment and conditioning and through the application of the release from regulatory control. In the Specialised Division RAW-Kozloduy, practices are applied for minimization of the volume of

RAW for disposal through the reduction of the compactable RAW volume. A procedure is introduced for clearance of decontaminated metal RAW. Procedures for clearance of material from decommissioning of nuclear facilities have been developed too.

Consideration of the interdependence of the various stages in the RAW management

Among the main responsibilities of the nuclear facilities operators, according to Article 5 (1) (11) of the *Regulation on the Safe Management of Radioactive Waste*, is to take into account the interrelations between various stages in RAW management. It is required that RAW management activities are performed in such a way that facilitates the future management stages. The methods, used for RAW processing shall ensure the compliance with the acceptance criteria for storage and/or disposal.

The Regulation obliges the sites, generating RAW to develop and present programmes for management of all generated RAW. The programme shall include:

- Existing and envisioned sources, flows, amounts and characteristics of the RAW;
- Option chosen for the management of each RAW flow, including deadlines and activities for processing, storage and disposal or release from regulatory control;
- Demonstration of the compliance with the National strategy for RAW management and with the main requirements on the RAW management following from the ASUNE (as well as the regulations on its application)
- Description of the approach used for safety ensuring in the RAW management;
- Administrative organization and infrastructure for the implementation of the program;
- Necessary for the fulfilment finance resources, sources of financing and risk assessment.

By its nature and purpose the program is a practical approach for the implementation of the principles of optimization and justification of the RAW management activities.

In the cases, when the RAW management is performed by more than one site, the programme shall be agreed between the different operators.

Since 2005, the Kozloduy NPP maintains this type of agreed programs with the SE RAW and submits them to the NRA for approval upon making modifications.

The requirements for the physical transferring of RAW between operators of different nuclear facilities are set with the *Regulation on the terms and procedure for delivery of radioactive waste to the radioactive waste state-owned company*, which is a part from the developed mechanism to take into account the interrelations of the different stages of RAW management.

The design of NDF provides for acceptance of stored packages of conditioned radioactive waste from the KNPP site.

Protection of the individuals, population, environment, and future generations

Detailed information about the methods of the national legislation to apply the common principles for limiting of exposure doses, practice justification and activities, optimization for the purposes of the protection of the personnel and population is presented in Section F of this Report (Article 24 of the Convention).

The exposure dose limits for the future generations that may results from the RAW disposal, adopted by the Bulgarian legislation, are not more liberal than the currently applicable dose limits for the population. The specific values as well as the methods applied for limiting the doses are discussed in Section F of this Report.

Avoiding imposing undue burden on future generations

The Bulgarian legislation is based on the principle to avoid the imposing of unjustified burdens on the future generations. In the *Regulation on the Safe Management of Radioactive Waste*, this principle has been developed in the direction of timely processing of RAW until the completion of a long-term safe form, as well as timely disposal of the processed waste. The Regulation also contains requirements for the control after the decommissioning of the facilities and monitoring according to the assessments made. The adopted in 2011 Strategy for SF and RAW Management also confirms the plans for the construction of a National Disposal Facility for low and intermediate level activity waste and a concept for high level activity and long lived RAW and applies the principle for protection and avoiding the imposing of burdens on future generations.

More detailed information about the planned activities on siting for the National disposal facility for low and intermediate level RAW is presented in the Report under Article 13 and in Section K of the Convention. Other planned measures are discussed in the Report in Section K.

In recent years, the concepts of decommissioning of nuclear facilities have also been developed further. In the updated strategy for the decommissioning of units 1-4 of Kozloduy NPP the concept of immediate dismantling has been adopted. The provision of the necessary funds for management of RAW, including those from decommissioning is not left for future generations. The *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* and *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* regulate the collection, spending and efficient control of the necessary resources.

Biological, chemical and other risks

Biological, chemical and other risks are subject to the national legislation in the area of health protection and environmental protection. The nature of RAW management does not imply other types of severe risk except radiation. Nevertheless, during the licensing process, the NRA oversees that the respective legislation is observed also in the above areas. The risk assessment in these areas is subject of the EIA, which itself is required in accordance with the *Regulation on the Procedure for Issuing Licences and Permits for Safe Use of Nuclear Energy* at all stages of the lifecycle of the nuclear facility.

In the cases of institutional RAW, generated in medicine and scientific research, the conventional risks are considered in special procedures for RAW management, as the requirements of the applicable regulations are observed.

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 in the previous national reports

The existing facilities as of the date of the Convention entering into force are presented.

It is pointed out that the safety assessment of the existing facilities is set in the national legislation as a basic requirement for re-issuance of an operational license for the facility. The term of the license shall not exceed 10 years.

It is noted that the results from the safety assessment of the RAW management facilities, operated by the Kozloduy NPP, Specialized Division RAW Kozloduy, and Specialized Division Permanent Repository for Radioactive Waste – Novi Han (SD PRRAW Novi Han) of the State Enterprise Radioactive Waste (SE RAW) present the protection of the personnel and population during normal operation and in case of emergency.

Information is presented about RAW management from old practices, such as RAW from uranium mining and uranium production as well as stored disused sealed sources from other nuclear facilities.

Existing facilities

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

NPP Kozloduy facilities

The Kozloduy NPP has available facilities for storage and processing of RAW, built according to the plant design. The operation of these facilities is considered as part of the NPP operation and it is also subject of the unified licensing regime. Safety inspections of the facilities for RAW processing and storage are conducted during the periodic safety inspections of the NPP.

For the period 2011- beginning of 2013 updates have been made of the SARs of units 5 and 6, concerning modifications in structures, systems and components important to safety, new analyses of transients and emergency regimes as well as the requirement concerning the description of the design basis.

SE RAW facilities

Periodic safety review are conducted of the RAW management facilities operated through the Specialized Division RAW Kozloduy, Specialized Division Permanent Repository for Radioactive Waste – Novi Han (SD PRRAW Novi Han) and of units 1 - 4 of Kozloduy NPP as facilities for RAW management, operated through the Specialized Division Decommissioning – Kozloduy.

After the declaring of units 1-4 of Kozloduy NPP as a RAW management facility, the appointed operator SE RAW manages the project for development of SAR for their decommissioning.

The SAR for the decommissioning of the units 1 and 2 of Kozloduy NPP has been developed. The review and editing of the two documents is in process.

Assessments have been made of the safety of some installations in these facilities including preparation of SAR for the low level activity contaminated soil storage facility under the Specialized Division RAW Kozloduy.

In all assessments, the generally accepted analytical approaches have been used, including analysis of possible events (internal and external). Based on detailed analyses the probable events have been filtered and the possible scenarios in the assessments were generated.

The results from the assessments prove that the protection of the personnel and population is ensured during normal operation and in case of emergency and that the contribution of the facilities for the population exposure is negligible.

The updated Safety Assessment Reports are submitted for review to the NRA as part of the procedure for renewal and issuance of the respective licenses.

In 2011, the operational license of the SD PRRAW – Novi Han was renewed for 8 years.

In 2012, applications were submitted to the NRA by the SE RAW for issuance of a license for decommissioning of units 1 and 2 of Kozloduy NPP. In 2013, additional documents were submitted to the NRA, complementary to the application, based on the NRA remarks on the supplied documents. The issuance of the licenses for the units 1 and 2 decommissioning is forthcoming.

In 2013, the NRA issued licenses for decommissioning of the units 3 and 4 of Kozloduy NPP as RAW management facilities subject of decommissioning for a 5 year period.

As a result from the regulatory review of the documents, the transitional conditions of the license have been formulated, that impose mandatory organizational and technical measures with the respective deadlines. Thus, the continuity of the process of steady improvement of the safety of nuclear facilities is guaranteed.

Previous practices

In accordance with the *Regulation on the terms and procedure for delivery of radioactive waste to the radioactive waste state-owned company* SE RAW, measures for acceptance of RAW from previous practices are being conducted, mainly disused sealed orphan sources or from bankrupt industrial units. Additional information is presented in Section J of this Report.

RAW from the closed uranium mining

The mitigation of the consequence from the uranium mining and processing in the Republic of Bulgaria is performed in accordance with the Decree of the Council of Ministers № 74 from 27.03.1998, modified and amended in 2007 which includes measures for reduction of the environmental impact for an expanded list of uranium production sites. In accordance with the programme developed by the Ministry of Environment and Water, the measures include liquidation and remediation activities and monitoring. For the most part, the measures following from the Decree 74/98 for elimination of the consequences from the uranium mining and uranium ore processing are fulfilled. The problems with the remediation and conservation of the tailing pond Buhovo and the uranium contaminated terrains in "Yana" are still unsolved. In the so called country house zone around Sliven, the contaminated areas of piles are built up and it is not possible to start the implementation of the project for remediation of dumps in the area.

Cleaning of the uranium contaminated water from ores is being done in the sites "Chora", "Byalata voda" and "Iskra". In view of the risk assessments done and the decision of the Advisory Board to MEE, the construction of new cleaning facilities for other sites is not envisaged.

Detailed information about previous practices is presented in the Appendices 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 in the previous national reports

The previous reports present the requirements of the ASUNE concerning the licensing regime for siting of new facilities and the requirements of the EPA for developing EIA for these facilities. The reports contain information about the legal requirements for informing the public and consultations with the potentially affected neighbouring countries.

Special attention has been paid on the requirements for RAW disposal facilities – sites as required in the *Regulation for safe management of radioactive waste*. The same regulation defines four main phases of site selection and the required by the regulator document submissions.

Evaluation of the site proposed for RAW management facility

The licensing regime for site selection for a RAW management facility is the same as for any other nuclear facility as discussed in article 6 of the Convention. For approval of the site by the NRA, submission of the preliminary safety analysis report is required, that takes into account all factors, related to the site safety, which can have influence on the safety of such facility during its operational life, and also for a disposal facility after its closure.

According to the *Regulation for safe management of radioactive waste the* site selection for a facility for processing and storage of RAW shall be conducted on the basis of assessment of the following:

- man-made and natural factors;
- impact of the facility on the environment and population;
- radiation impact of the facility on the population;
- specific site characteristics significant for the migration and the accumulation of radioactive substances
- possibility for application of measures for protection of the population in case of accident in the facility

For site selection for the disposal facility, an evaluation of the ability of the site to ensure the integrity of the protective barriers for a maximum period is required as well as the demonstration of the ability of the site to ensure the protection of the population for the selected disposal concept.

Site selection for the proposed facility – NDF

The site selection process for the NDF was completed in 2012. It has been carried out in accordance with the regulatory requirements and conditions set in the permissions for site selection, issued by the NRA Chairman.

In 2013, a request for issuing a site approval order was submitted. As a result from the review and evaluation of the submitted documents, the necessity for amendment and revision of the preliminary SAR was realized.

As the decision of the Minister of Environment and Water for the approval of Environmental Impact Assessment (EIA) for the decision was attacked in court and was quashed by the Supreme Administrative Court, a new updated Terms of Reference was developed to determine the scope and content of the EIA of the NDF and the procedure has been restarted.

Access to information related to safety and consulting with the neighbouring countries about such facility

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

The Report has been developed for EIA of the investment proposal for construction of NDF, on the basis of the Terms of Reference, approved by MEW that defines the scope and content of the EPA.

Public hearings on the EIA report have been conducted in the region.

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 Terms of Reference to define the scope and content of the EIA, the Report for EIA of the investment proposal for construction of NRRAW is submitted and public hearings have been performed.

Additional information related to the site selection for NDF is presented in Section 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."

Limitation of the radiological impact in the design and construction of a facility for radioactive waste management

The dose limits for designing are set in the *Regulation on basic norms of radiation protection*. The set of specific technical requirements and the criteria the radiation protection optimization in the design of a NF are set by the *Regulation for safe management of radioactive waste.*

The control of the application of the regulatory requirements is a stipulated implementary mechanism. The design and construction as stages of the facility lifetime are subject to licensing regime and according to the ASUNE and the *Regulation on the Procedure for Issuing Licences and Permits for Safe Use of Nuclear Energy* it is necessary that at a very early stage, proof of the compliance of the design with all applicable safety requirements has to be provided. The procedure for issuance of a design permission and technical design approval requires that the licensee prepares an Intermediate Safety Analysis Report (ISAR), which is a subject to review by the NRA and must contain all necessary information confirming that the possible radiological impacts are limited to an acceptable level. It is also required that the results from an independent verification of the safety analyses are provided.

Measures on decommissioning and closing at the process of NF design development

At all stages of the lifetime of the facility for RAW processing and storage, including design, the licensee has to plan and implement measures facilitating the facility decommissioning.

The ASUNE and the *Regulation on the Procedure for Issuing Licences and Permits for Safe Use of Nuclear Energy* require that the ISAR includes a section Decommissioning for nuclear facilities, subject of decommissioning, which justifies the decommissioning concept, suitability for implementation of deactivation and dismantling works and possibilities for exemption from regulation.

In case of a disposal facility, the Intermediate Safety Analysis Report (ISAR) has to include a section "Safety analyses after closure" for assessment of the long-term stability of the facility and of the public exposure during normal operation and in case of failure of the protective barriers, including human activities on the site.

Facilities in design and construction stage

In 2011, the NRA Chairman issued permission to the Kozloduy NPP for design of a RAW processing facility – Plasma melting facility.

In 2012, in accordance with Article 38 of *Regulation on the Procedure for Issuing Licences and Permits for Safe Use of Nuclear Energy* a design permit was issued for the design of the NDF.

In the beginning of 2014, new revision of the Technical design and Intermediate Safety Analysis Report were submitted to the NRA. For the conducting of the regulatory review of the documentation, the NRA received assistance from RISKAUDIT within the framework of a project, funded by the KIDSF.

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 in previous national reports

The shortcomings highlighted during the first review of the fulfilment of the obligations on the Convention by the Republic of Bulgaria, have been addressed and, in the Second National Report the basic principles in this field were presented according to the newly adopted at that time *Regulation for safe management of radioactive waste.* In the Regulation, the requirements for the criteria for safety of RAW management facilities are formulated. The compliance with these criteria is a subject to verification by using the safety assessments. The types of safety assessments at each stage of the lifetime of the facility are regulated. The respective principles and criteria are determined also for RAW disposal facilities after closure.

The EPA requirements regarding the carrying out of the EIA are presented.

Changes in the legislative basis

In 2013, the newly adopted *Regulation for safe management of radioactive waste* provides more detailed and precise description of the requirements, connected with safety assessment of nuclear facilities. The safety assessment should contain systematic analyses of all radiation hazards in order to justify the ability of the facility and the developed management system to ensure its safety during normal operation or in carrying out its activities, as well as in case of deviation from normal operation and design basis accidents.

The scope of the safety assessment is determined by the application of a graded approach, depending on the radiation risk that the facility or the activity may cause.

In the application of the graded approach, it is taken into account the existing RAW inventory and the possible releases to the environment the complexity of the facility or activities, as well as the extent of the practical verification of the used technologies.

The safety assessment shall cover all stages of the lifetime of the facility or activity, and beside the

facility it shall include the RAW stored taking into account their characteristics and also packages.

Measures for carrying out safety assessments before the construction and before the commissioning of RAW facilities

The legislative safety criteria for RAW management facilities are discussed in the Report under Article 24 and Article 11 iv.

A control mechanism is set through the legislation for the application of these requirements. In the *Regulation on the Procedure for Issuing Licences and Permits for Safe Use of Nuclear Energy* the requirements regarding the stages for the safety assessment development and updating are determined.

Before the construction of RAW management facilities, the development of safety assessments is required at all stages of siting and design. For the site approval it is required that a Preliminary Safety Assessment Report (PSAR) is submitted to the NRA. The design stage is completed after the design has been approved by the NRA. It is approved only if based on ISAR. These requirements apply both to RAW processing and storage facilities and disposal facilities.

According to Article 60 of the *Regulation for safe management of radioactive waste*, the safety assessment of a disposal facility should cover timeframe, sufficient for attainment of the maximum predicted dose for exposure of the population. The models used for the safety assessment should be verified and reviewed in order to confirm their applicability for the assessed time period. The safety assessment should determine and justify the measure for limitation of the radionuclide migration in the environment in case of human intrusion after the closure of the disposal facility and take into account low incidence events and human activities, which may affect the operation of the facility.

Before operation of the nuclear facility, the safety assessment is updated with regard of the results from the process of its commissioning. The final safety analysis report (FSAR) shall be submitted for review to the regulatory body along with the application for issuance of an operational licence.

The requirements on the structure and content of the safety analyses reports are set in the *Regulation on the Procedure for Issuing Licences and Permits for Safe Use of Nuclear Energy*. The information, necessary to determine whether the possible radiological impacts are within the legal limits and whether they have been optimized to acceptable levels, is specified in detail.

Safety assessments of RAW management facilities

In the period 2011-2014 an assessment of the safety of nuclear facilities operated by SE RAW was conducted.

In connection with the renewal of the operational licence for the SD RAW – Kozloduy, a review and update of the Safety Review Report of the nuclear facility for RAW management has been done. In 2014, in fulfilment of a licence condition, Safety Analysis Report of the facility Contaminated Soil Storage Facility has been prepared and submitted to the NRA.

The results from the assessments demonstrate that the protection of the personnel and the population is guaranteed during normal operation and in case of emergency, and that the contribution of the facility to the exposure of the population is negligible. The safety analyses reports have been submitted to the NRA for review in the framework of the procedure for renewal and issuance of the respective operational licences and permissions.

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 in previous national reports

The changes in the national legislation, introduced in regard of the provisions of Article 16 of the Convention are presented.

The safety requirements for operation of RAW management facilities are specified in the ASUNE and especially in the *Regulation for safe management of radioactive waste*. Some of the requirements are common for all nuclear facilities and some are specific for RAW management facilities.

Licence for operation of RAW management facilities

The RAW management facilities are subject to the unified licensing regime for nuclear facility operation in the Republic of Bulgaria in accordance with the *Regulation on the Procedure for Issuing Licences and Permits for Safe Use of Nuclear Energy*. The issuance of an operational licence and the necessary conditions are discussed in detail under Article 9 of this Report.

The main document, based on which the licence is issued, is the final safety analysis report (FSAR), which takes into account the results from the commissioning of the facility. The documents are also presented regarding the fulfilment of the Programme for commissioning and about the fulfilment of the conditions of the issued permissions. The RAW management facility shall be commissioned in accordance with the licensee's program defining the activities on the verification of the compliance of the existing structures, systems and components with the design requirements. The programme should include tests with mockup and real RAW. The fulfilment of the conditions of the commissioning permission shall be confirmed by a commission including NRA inspectors, appointed by the NRA Chairman. The commission checks the submitted documents and performs on-site inspections.

For the operational licence issuance, it is also necessary that RAW acceptance criteria shall be presented for approval.

For the issuing of a licence for RAW disposal facility a plan for closure and post-closure control is also required.

The operational licence is issued for a 10-year term. For the renewal of the operational licence, the licensee shall apply with an updated safety assessment. The report should consider the legislation, the actual condition of the nuclear facility and the design lifetime.

In 2013, the NRA has issued operational licenses for the units 3 and 4 of the Kozloduy NPP as RAW management facility, after the Council of Ministers of the Republic of Bulgaria, adopted a decision in 2012 to declare the units as RAW management facilities.

Operational limits and conditions

According to Article 41 of the *Regulation for safe management of radioactive waste* the operation shall be conducted in compliance with the operational limits and conditions. They are determined on the basis of the design, safety analyses and the commissioning tests, and if necessary, are periodically reviewed in order to document the operational experience, modifications made to structures, systems and components important to safety, and in view of the latest development of science and technology. The licensee can define administrative control levels, lower than the operational levels that can be used as objectives in the process of improvement of operation.

The *Regulation on the Procedure for Issuing Licences and Permits for Safe Use of Nuclear Energy* requires that, with the application for issuance of a commissioning permit for a nuclear facility, operational limits and conditions are submitted to the NRA, as follows:

- Safety limits;
- Values of the parameters for actuation of the safety systems;
- Operational limits and conditions;
- Tests, inspections, supervision and operational control of the systems, important to safety;
- Actions of the personnel during deviations from the normal operation.

The operational limits and conditions 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 standard order for implementation of the technological operations, related to safety.

Changes in the technical specifications, and respectively the operational limits and conditions for, are subject to the permission regime.

Conformity with the established operational procedures

There are legislative requirements for the availability of procedures for operation, maintenance, monitoring etc.

According to Article 42 of the *Regulation for safe management of radioactive waste* during the nuclear facility operation it is necessary that the maintenance, tests and supervision procedures regarding the structures, systems and components important to safety, is performed in accordance with the schedules, maintenance and supervision procedures for maintaining design parameters for reliability and availability, as well as to the corrective measures in case of deviation of the parameters of the processed RAW or packages from the technical specifications.

The compliance with the regulatory requirements and the adequacy of the procedures is supervised both during the licensing process and during the issuing of licences and permits and during the regulatory control on the fulfilment of the requirements of the issued licences and permissions.

The application of the procedures is subject of topical inspections according the annual inspection plan of the regulatory body, as well as to a subsequent control on the fulfilment of the recommendations and prescriptions made.

Engineering and technical support

The ASUNE requires availability of the relevant engineering and technical support in all areas, related to the safety throughout the operational lifetime of the facility.

According to the *Regulation for safe management of radioactive waste* during the operation of the facility, the licensee is required to ensure engineering maintenance for the activities aiming at analyzing the behaviour of the SSC, important to safety, justification of the proposed modifications in the design and operational documentation, analysis of operational events as well as the efficiency of the RAW management.

A license is issued to a legal entity that has financial and technical resources and adequately qualified and licensed personnel with the relevant level of education and training for all activities of the license.

Characterisation and sorting of the waste

The requirements are set in the *Regulation for safe management of radioactive waste,* as according to Article 42, in the RAW management facility operation an control of the delivered for processing RAW has to be ensured in order to confirm the compliance with the acceptance criteria including tests and control of the processed RAW (or packages) before their storage.

The licensee develops and applies procedures for waste characterization and sorting, with consideration of the specificities of the technological process and interdependences in the generation and management of RAW.

The procedures for the characterization of RAW from the Kozloduy NPP are aimed at determining of their characteristics with view of their subsequent sorting, treatment, conditioning, as well as for the purposes of radiation protection of the personnel during the handling. The release of material from regulatory control is also an important aspect, receiving ever increasing attention by the operators.

A wide range investigation has been made for the characterization of the liquid raw from the Kozloduy NPP in regard of the difficult to measure radionuclides, important to the long-term safety. A similar investigation was completed in 2012 for solid and historical waste.

The activities on the characterization of the spent ion-exchange resins from the Kozloduy NPP units 1-4 continues. Information in connection with the projects for RAW and radiological investigation of the units 1-4 is presented in Section K of this Report.

Reporting events, operational experience analysis

According to article 19 of the ASUNE, in all operational licences for operation of NF, the requirements for reporting of safety-related incidents should be included. The terms and conditions of the reporting 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 following the presentation of the Fourth National Report, one operational event subject to reporting, according to the conditions of the Regulation was registered in the SD RAW-Kozloduy.

According to Article 42 of the *Regulation for safe management of radioactive waste* during the operation of a RAW management facility analysis should be performed of the operational events significant to safety, they should be reported to the NRA and corrective measures should be implemented for prevention of the repetition of the events. A feedback programme for operational experience should be applied aiming at documentation, classification, analyzing, and archiving of the technological and radiation parameters, SSC failures, operational events, and safety indicators.

An instrument for review and analysis of the own operational experience is the system of safety 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 Issuing Licences and Permits for Safe Use of Nuclear Energy* it is required to update periodically the plan for decommissioning for issuing and re-issuing of the operation licence. At the same time the costs assessment for decommissioning is updated. The updated plans are subject to review by the regulator in the frames of the process of issuing/renewal of the operational license.

In a case of a RAW disposal facility, a closure plan should be presented.

During the decommissioning/closure plan updating, the regulations should be taken into account as well as the actual condition of the nuclear facility.

Information about the stage of the development of the decommissioning plans for nuclear facilities that have been shutdown is included in the Report under Article 26 of the Convention.

The requirements about the plan for the closure (structure and content) are specified in Article 43 of the *Regulation for safe management of radioactive waste.*

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."

Brief review of the information presented in the previous National Reports

The requirements for institutional control 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 after the closure of the facility – active and passive control, and the maximum and minimum terms of their implementation are defined.

Information storage

In the *Regulation for safe management of radioactive waste* the requirement is set that the activities on the closure of RAW disposal facilities include updating and archiving of all operational information for the nuclear facility.

Institutional control and measures for intervention

According to Article 45 of the *Regulation for safe management of radioactive waste* the responsibility for the control after the closure of the RAW disposal facility is determined by a decision of the Council of Ministers. It determines the entities, responsible for the determination of the necessity and for performing of active restoration and correction measures in the site of the RAW disposal facility.

According to Article 60(3) of the *Regulation for safe management of radioactive waste* in case of unforeseen discharges after the closure of the RAW disposal facility, the intervention levels set in the *Regulation on emergency planning and emergency preparedness in case of nuclear and radiological emergencies* are observed.

The performing of active restoration works and corrective on-site measures for intervention during the active control in case for determined discrepancy between the results of the monitoring and the safety assessment is allowed only in case of proven, through assessments and analyses, necessity and efficiency 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."

A brief overview of the information presented within the previous national reports

It is stated that the export and transport of nuclear material and in particular of SF are subject to authorization, the requirements for issuing a permit for export and transport of SF being defined in the ASUNE.

It is noted that the Republic of Bulgaria has a practice only as a sending country of spent fuel. The international agreements relating to the adoption of processing the spent fuel by the Russian Federation and its transit through the territory of Ukraine are hereto presented.

The transport scheme is described for the transport of spent fuel by rail and waterway.

The provisions of the *Regulation for issuing licenses and permits for safe use of nuclear energy*, related to the implementation of the obligations under this Article of the Convention are presented as well. It is stated that the application for authorization for the transport of nuclear material must be accompanied by:

- transport permits or the corresponding administrative acts issued by the competent authorities of the destination country and the countries through which the transportation will be carried out - in case of export of nuclear material;
- documents regulating the relations between the consignor and consignee and between the applicant and subcontractors relating to the transportation performed throughout the country;
- administrative acts issued by the respective competent authorities for approval of the transport packaging in accordance with the *Regulation on the conditions and order for transportation of radioactive materials*;
- documents certifying that if the shipment can not be made, or the transport conditions can not be met, the applicant will return the goods to the starting point and the consignor will receive the cargo.

It is indicated that the safety requirements for transport of SF are defined in the *Regulation on the conditions and order for transportation of radioactive material*, which was developed in accordance with the requirements of the IAEA document "Rules for the Safe Transport of Radioactive Material" TS-R-1, as well as with the requirements of relevant international rules for transport of dangerous goods:

- International rules for transport of dangerous goods by rail (RID) of the Central Office for International Railway Transport (OCTI) - these rules are an annex to the Convention on International Carriage by Rail (COTIF);
- European Agreement concerning the International Transport of Dangerous Goods by Road (ADR);
- European Agreement concerning the International Transport of Dangerous Goods by Inland Waterways (ADN)
- Technical Instruction for the Safe Transport of Dangerous Goods by Air (ICAO - Technical Instructions);
- International Maritime Dangerous Goods Code (IMDG Code by IMO);

It is stated that in 2010 the national legislation has been harmonized in accordance with the requirements of Directive 2006/117/EURATOM having introduced the use of the so-called "Standard document" in accordance with the requirements of the Directive. The provision of the ASUNE stating that transit of RAW and SF can be carried out only following a Council of Ministers decision has been repealed.

Amendments in the legislative basis related to cross-border transport of SF

In. February 2014 the Council of Ministers adopted amendments to the *Regulation on the conditions and order for transportation of radioactive substances*, which reflect the amendments made in 2010 to the ASUNE in respect to the transport of radioactive substances, reflecting the amendments in the Regulations and Directives of the European Commission, the ratified by the Republic of Bulgaria international agreements on the transport of dangerous goods (in the section category 7), as well as of the documents of the International Atomic Energy Agency in the field. The requirements of Directive 2006/117 / Euratom of the Council as of 2006 have been introduced for international transport within the European Union during import, export or transit through the European Union of spent fuel or radioactive waste, as well as the requirements of the European Commission for establishing of a standard document for the supervision and control of shipments of radioactive waste and spent fuel.

Practices in cross-border transport of SF

In the period after the presentation of the third national report the respective licenses have been issued and cross-border transport of SF has been performed as follows:

- 2011 - from WWER-440 type reactors - 2.
- 2012 - from WWER-440 type reactors - 3.
- 2013 - from WWER-440 type reactors - 3.

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."

A brief overview of the information presented within the previous national reports

It is stated that activities involving radioactive sources are subject to a permissible regime, established by the *ASUNE and the Regulation on the procedure for issuing licenses and permits for safe use of nuclear energy*. The specific safety requirements of the *Regulation on BNRP and the Regulation on radiation protection during activities with SIR* are complied with as well.

The NRA maintains a *National register of the sources of ionizing radiation in the Republic of Bulgaria* with data on all sealed radioactive sources from category 1 to 5 and for the licensees and permit holders who store and use them.

When a source is no longer being used, it is considered as radioactive waste and according to the *ASUNE* must be submitted by its owner to SE RAW which is licensed to manage RAW. The NRA shall be notified for each shipment.

In the cases where the owner is unknown or the licensee is declared insolvent, the sealed source becomes state property and based on an issued by the NRA Chairman order are submitted to the SE RAW.

The measures taken by the Republic of Bulgaria to identify sources with an unknown owner and for preventing the illegal cross-border traffic of sealed sources have been presented. A large part of these measures are being implemented jointly with the Government of the United States and the EU.

Management of disused sealed sources

The import of sealed sources from category 1, 2 or 3, which half-life is greater than 5 years, can be carried out only upon the condition that their return to the respective manufacturer after termination of their use is ensured.

The storage of spent sealed sources is subject to a licensing regime. In order to motivate the licensees to transmit without delay to SE RAW the spent sealed sources for centralized long-term storage in the SD RAW Novi Han, which is a licensed by the NRA facility for radioactive waste management, the state taxes have been reduced in recent years.

With the construction of a national repository for low and intermediate level radioactive waste the question for the disposal of the majority of currently stored spent sources will be resolved.

In the period 2011-2013 the following SIR have been accepted for storage in SD RAW - Novi Han, according to type and activity as follows:

Year	2011	2012	2013
Concluded contracts	43	74	49
Accepted smoke detectors/SIR	2 766/3 436	4 031/5 791	2 559/4 467
Accepted other SIR	1 220	4 298	1 191
Total activity [Bq]	2.10^{15}	2.10^{13}	1.10^{15}

The capacity of the SE RAW is sufficient for reception, processing and storage of spent sources from industry, science and medicine.

The submission of radioactive sources declared as RAW is carried out in accordance with the *Regulation on the conditions and procedures for transfer of radioactive waste to the State Enterprise "Radioactive Waste"*.

The subsequent use of spent high-level active sources in the Republic of Bulgaria is carried out under a license issued by the NRA for the use of a source for a specific purpose other than the original purpose for which the source was manufactured and delivered.

The issues of recycling, subsequent use, certification and extending the term for safe operation of highly active sources have not yet been fully resolved in the Bulgarian legislation.

Reverse import of disused sealed sources

The Bulgarian legislation does not prohibit the reverse import of spent sealed sources in the Republic of Bulgaria, if they have been produced in the country.

Applications for the authorization of such imports have not been submitted to the NRA, as far as there are no licensed manufacturers of sealed SIR present in the Republic of Bulgaria.

SECTION K: ACTIVITIES PLANNED TO IMPROVE SAFETY

The adopted in 2011 Strategy for Management of SF and RAW until 2030 is a natural extension of the practically executed previous national programme – strategy from 2004, and sets a more distant horizon in the field of management of SF and RAW. The strategy is a basis for planning of the activities of the nuclear operators as well as of other organizations in the Republic of Bulgaria with responsibility for the safety and control of the radiation risk.

This report includes the measures that are currently under implementation and/or are planned for implementation in the next five years.

1. Establishment of a national disposal facility for low and intermediate level RAW

This is the most important national project for implementation in the medium term as defined in the National Strategy in the field of management of RAW. The construction of a national repository has been is adopted a Council of Ministers decision in 2005.

The project is for a modular, near-surface, multi barrier engineering facility of a modular type, allowing a sequential construction of individual elements and the gradual increase in capacity. The capacity of the first stage of construction is 50 000 m3.

The process of site selection for the NDF was completed in 2012. It has been fulfilled in accordance with the requirements of the legislative documents and conditions of the issued by the NRA Chairman permits for site selection of the nuclear facility.

In 2013, a request was submitted for the approval by the NRA of the selected site. The order for approval of the site may be issued only if there is in force a decision on the EIA report.

2. Disposal of high level RAW

With regard to SF, the National Strategy does not exclude a priori a discussion over each of the three possible options:

1. Reprocessing in other countries which have the potential to extract from the SF components for reuse in reactor installations without the return of high-level waste for disposal;
2. Processing in other countries, which have the necessary potential to extract from the SF components for reuse in the reactor installations including the return of high level waste for disposal;
3. Disposal of SF in the country.

For high-level RAW there must be a general decision on disposal jointly with the low and intermediate level long-lived RAW.

A programme has been developed for research and construction of a geological disposal facility for high-level and low and intermediate level long-lived RAW. The programme envisages the adoption of a methodology for determining the quantity and quality of products resulting from the processing of SNF subject to returning in the country, the development of the possible options for long-term management in the country, the construction of a warehouse for long term storage of HLW from reprocessing of SNF, high level SIR and ILRAW, Cat. 2b at the Kozloduy NPP site.

Currently SE RAW carries out activities related to the pre-feasibility study for the construction of a deep geological repository. A preliminary zoning of the territory of the Republic of Bulgaria has been conducted. A composed summary map has been drafted which has localized three regions of interest. In these areas of interest are identified five potential areas, whose characteristics best meet the preferred environmental conditions, characteristics and requirements. A number of six potential geological units have been localized, which can be further investigated.

3 National legislation in the field of management of SF and RAW

A balanced approach towards the continuous improvement of the legal and regulatory framework has been adopted.

The work continues on the development of new and the updating of existing regulatory guides in connection with the order for enforcement of the regulations. The development of regulatory guides for the following aspects has been planned, namely:

- Exemption from regulatory control of nuclear facilities and the related thereto activities;
- The conditions for closure of facilities for the disposal of RAW;
- The requirements towards the safety assessment of disposal facilities for RAW.

4. Planned activities for improving the safety of existing nuclear facilities

4.1 SD RAW Kozloduy

4.1.1 The planned activities in the Programme for enhancing the safety of the facility for waste management of the Kozloduy NPP have been completed.

4.1.2 The programme for management of RAW at the site "Lime Plant" is being implemented, which maintains a steady rate of processing of the stored currently unprocessed historical RAW.

4.1.3 A project has been completed on the characterization of the liquid RAW from the Kozloduy NPP; in 2012 was completed the work on the characterization of solid RAW from the Kozloduy NPP.

4.1.4 A technical project is being implemented for rehabilitation measures of a depot for soil, construction and other bulk technological waste with very low level of radioactive contamination.

4.2 SD Decommissioning Kozloduy

4.2.1 Processing of solid phase in tank of evaporation concentrate (TEC)

A project is being implemented on the delivery of an installation for the extraction and processing of the solid phase from TEC. A pilot installation has been installed for the processing of solids.

4.2.2 Introduction of methods for processing and conditioning of RAW with a high coefficient of volume reduction.

The project is aimed at building a facility for the treatment of solid low level radioactive waste from the operation of Units 1 to 6 of the Kozloduy NPP, as well as during the first stages of the decommissioning process. The use of plasma technology is envisaged, which will provide a significant reduction in the starting volume of RAW. The final product - conditioned RAW must be suitable for transportation and temporary storage in the facilities at the Kozloduy NPP. The project is at the stage of approval of technical design.

4.2.3 Conditioning of the spent ion exchange resins.

The project is aimed for the supply of an installation for extraction and conditioning of spent ion exchange resins from the tanks in AB-1 and AB-2 of the Kozloduy NPP.

A technical design of the facility has been prepared. The requirements to the final product have been specified.

5. International cooperation in the management of RAW and SNF.

Considering the far-reaching benefits, the Republic of Bulgaria will continue its participation in international organizations, initiatives and projects.

SECTION L: ANNEXES

Annex L-1

List of the spent fuel management facilities, their location, basic function and main characteristics

Annex L-2

Spent fuel inventory

Annex L-3

List of the radioactive waste management facilities, their location, basic function and main characteristics

Annex L-4

Radioactive waste inventory

Annex L-5

List of the international treaties, acts and secondary legislation applicable to the management of spent fuel facilities and the radioactive waste facilities.

Annex L-6

Human and financial resources in the management of SF and RAW

Annex L-7

Classification of RAW according to the Regulation for safety of RAW management

Annex L-1

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

I. Kozloduy NPP

I.1 Wet spent fuel storage facility

The wet spent fuel storage facility (WSFSF) is a separate building, located at the Kozloduy NPP site, in which are situated equipment and systems assuring subcriticality, residual heat removal and biological protection.

The spent fuel storage facility is designed for storage of spent fuel (SF) from reactors WWER-440 and WWER-1000 after at least three years of initial storage in at-the-reactor SF pools. The storage is a "wet" type; the spent fuel is stored under water. The facility has four pools for SF storage. The SF assemblies are stored in transport baskets. The capacity of the 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 ensured by:

- heat exchangers, cooled with technical water;
- evaporation of the water of the pool;
- ventilation of the above water volume;
- heat losses through the building structure.

Biological protection is assured by the building structure and the water layer above the SF in the SF pools.

WSFSF is integrated with the following NPP systems:

- physical protection system;
- emergency preparedness;
- radiation control;
- fire protection;
- emergency signalization system;
- radioactive and non-radioactive waste processing and storage.

The design of the existing WSFSF was developed in compliance with the normative documents in force, during the 70s of the last century, in the former Soviet Union. The spent fuel storage safety practically is based upon the application of the "defence in depth" 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 option for rapid water supply from the tanks with rate 10 times higher than the maximum designed losses of coolant 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 non-tight 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 pools (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;
- Ventilation systems, fire protection systems and control and management systems are available and in service;
- 12 control probe wells around the SFSF building are available for underground water activity control.

Appropriate analyses were conducted for the safety case of the WSFSF. The constructional and neutron-physical properties of the spent fuel assemblies assure their tightness and integrity conservation in case of completely dried pool, and air-cooling for a period of time, sufficient to take recovery actions (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 that allows modelling of the impact of a corrosive (aqueous) environment for a period of storage of 50 years. The satisfactory condition of the cladding following 50 years of underwater storage , provided that the specified water chemistry was confirmed by the complex non-destructive and destructive tests 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.

Evaluation has been made of the condition of the structural materials, the pool lining and the transport storage baskets. They kept their integrity. 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 old with up-to-date instrumentation with automatic recording in the data base).

In 2006 the areas for fuel receiving and refuelling were equipped 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 performed to determine the lifetime of the WSFSF building and equipment.

The current WSFSF license includes the activities of loading containers type "CONSTOR 440/84" with SF.

I.2 SFP-5 and 6

The Spent Fuel Pools (SFP) are situated in the containment and are used for storing of the spent fuel (until the residual heat of the spent fuel is reduced to the admissible levels) and also for temporary storage of control rod absorbers and dummy fuel assemblies.

The SFP has 4 parts, physically separated with partition walls up to elevation 28.93. Above elevation 28.93 up to 36.2 they share a common volume. 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. In the fourth compartment are placed the SF overpack, the fresh fuel baskets and the baskets holding hermetic storage tubes.

The racks and hermetic storage tubes for accommodating and storing of the assemblies are inside the fuel storage compartments. The racks are made by borated steal and assure subcriticality in the SFP, not less than 0,05 for design transients, including falling of a heavy object on them. The absorption of the rack baskets is assured during the whole term of operation. The rack structure allows:

- vertical arrangement of the fuel assemblies and the hermetic storage tubes;
- preventing of mechanical damages of the surfaces of the assemblies during insertion or taking out of the rack's guide frames;
- the assemblies and the hermetic storage tubes are firmly fixed to the rack;
- reliable decay heat removal of the spent fuel assemblies.
- 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, according to the requirements of 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 TK (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 TK has been taken out, the level of the boron solution above the assembly will not be reduced.

The surrounding 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 surrounding 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 pool 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 pool is filled to elevation 35.7. Thus, movement of the fuel underwater is ensured. To prevent pool overfilling, there are two overflow devices in each compartment of the pool - 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 pool is covered by plates. To avoid the plates breaking and falling in the pool, 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 in case of a main circuit pipeline rupture. The plates can withstand shock loads in the event of objects with a weight 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, and 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 capacity of each of the three channels is sufficient to ensure full heat removal from the reactor pool under any of the system operating modes.

I.3 Dry Spent Fuel Storage Facility /DSFSF/

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.

The DSFSF is equipped with systems for receiving, storage and shipment of casks with SF.

The main characteristics of the DSFSF are:

- The DSFSF is a standalone one storey construction divided in two areas – zone for accepting and storage hall. The two zones are physical separated by protecting wall.
- 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 accepting hall. A reinforced concrete pillars are used to support the roof and the crane. Steel constructions are used for the main support roof girders (frames). The roof coverage is made from metallic three-layer plates.
- The accepting hall and storage hall are serviced by a bridge crane with a 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 of hermetic shells provides a tight shell 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

Kozloduy NPP

The spent fuel at Kozloduy NPP site stored in the at-reactor SFPs and in the SFSF, at 31.12.2013 is equal to 797 tons heavy metal. This amount is distributed into 3336 spent fuel assemblies from WWER – 440 and 1028 spent fuel assemblies from WWER – 1000, total of 4364 spent fuel assemblies are stored.

Spent nuclear fuel inventory in SFSF by 31.12.2013

Reactor type	Assembly type	Initial enrichment of ^{235}U [%]	SFSF		**Total**	
			Number Assemblies	Weight of Heavy metal [kg]	**Number of Assemblies**	**Weight of Heavy Metal [kg]**
WWER-440	116	1,6	4	474	**3084**	**355701**
WWER-440	124	2,4	47	5489		
WWER-440	136	3,6	2717	314306		
WWER-440	216	1,6	6	670		
WWER-440	224	2,4	257	28857		
WWER-440	236	3,6	53	5905		
WWER-1000	A	2,0	12	5138	**252**	**101031**
WWER-1000	G	3,3	105	44000		
WWER-1000	GV	3,13	2	842		
WWER-1000	E	4,4	40	15337		
WWER-1000	ED	4,23	93	35714		
ОБЩО					**3336**	**456732**

Spent Fuel inventory by nomenclature and heavy metal in DSFSF by 31.12.2013

Reactor type	Assembly type	Initial enrichment of ^{235}U [%]	DSFSF		**TOTAL**	
			Number Assemblies	Weight of Heavy metal [kg]	**Number of Assemblies**	**Weight of Heavy metal [kg]**
WWER-440	124	2,4	12	1401	**252**	**29131**
WWER-440	136	3,6	228	26378		
WWER-440	236	3,6	12	1352		

Spent nuclear fuel by nomenclature and havy metal inventory in at-reactor SFPs by 31.12.2013

Reactor type	Assembly type	Initial enrichment of ^{235}U [%]	SFP-5		SFP-6		**TOTAL**	
			Number Assemblies	Weight of Heavy metal [kg]	Number Assemblies	Weight of Heavy metal [kg]	**Number of Assemblies**	**Weight of Heavy metal [kg]**
WWER-1000	V (3000)	3,0	1	389	1	391	**2**	**780**
WWER-1000	ED (4230)	4,4+3,6	94	36070	57	21856	**151**	**57926**
WWER-1000	E (4400)	4,4	68	25984	85	32480	**153**	**58464**
WWER-1000	N 3536	3,53	61	25173	61	25162	**122**	**50336**
WWER-1000	N 3996	3,99	30	12376	30	12412	**60**	**24788**
WWER-1000	N 4306	4,3	138	56667	150	61696	**288**	**118363**
ОБЩО			**392**	**156659**	**384**	**153997**	**776**	**310656**

TOTAL FOR KOZLODUY NPP

Reactor Type	**Number of Assemblies**	**Weight of Heavy metal [kg]**	**Approximate activity [Bq]**
WWER-440	3336	384 832	$0,8.10^{19}$
WWER-1000	1028	411 687	$3,2.10^{19}$
Total	**4364**	**796 519**	**$3,3.10^{19}$**

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 assembly 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 labelled with code 116, 124 and 136.

1.2 Regulating and shim fuel assembly (RSA)

Does not differ from a FA in general. The differences are 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 labelled with code 216, 224 and 236

2. Fuel assembly for WWER-1000 reactor

2.1. Assembly of TVS type for two year cycle:

The TVS assembly has steel 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%, 2,0%, 3,0%, 3,23% and 3,3% and are labelled with code: N, A, V, G, GV, D, E and ED respectively. In Kozloduy NPP are used also assemblies with enrichment of 2,0%, 3,0%, 3,23% и 3,3%. The fuel rods are filled with UO_2 tablets with central hole with diameter 1,5 mm. The assembly consists in total 429,7 kg Heavy metal.

2.2. Assembly of TVS-M type – for a three year cycle:

The TVSA assembly has a steel skeleton and dismantling structure. It has 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 up to 235 mm. The total length of the assembly is 4570 mm. The fuel assemblies are produced with enrichment of 1,6%, 3,0%, 3,6%, 4,23% and 4,4% and are labelled with codes: N, V, D, ED, E respectively. In Kozloduy NPP are used also assemblies with enrichment of 3,0%, 4,23% and 4,4%. The fuel rods are filled with UO_2 tablets with central hole with diameter 2,35 mm. The assembly consists in total 399,9 kg Heavy metal.

2.3. Assembly of TVSA type- for four year cycle:

The TVSA assembly has a zirconium skeleton and dismantling structure. It has 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 fuel assemblies are produced with enrichment of 1,3%, 2,2%, 3,53%,

3,9%. 3,99%, 4,3% and 4,38% and are labelled with codes N1300, N2200, N3536, N3906, N3996, N3996, N4306 and N4386 respectively. In Kozloduy NPP are used also assemblies with enrichment N3536 (GD), N3996 (S, SS), N4306 (ES, SE).The assemblies consist from 431,9 to total 434,7 kg heavy metal.

Annex L-3

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

1. RAW Management Facilities operated by Kozloduy NPP

1.1 Auxiliary Building-3

AB-3 is designed for temporary storage of solid RAW Category 2 (2-I, 2-II and 2-III according to the additional classification), 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 – 3 (AB-3), serving units 5 and 6.

The solid RAW category 2-I and 2-II are stored in a bunker type facility with upper hatch. There are eighteen units in operation, 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 solid RAW category 2-III are stored in a bunker type facilities with upper cylindrical hatch, monolithic reinforced structure providing the necessary bio-protection. Total net volume of 213 m^3. Operating conditions – room temperature, atmospheric pressure.

The liquid radioactive concentrate is stored in tanks from stainless steel each of which 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 spent sorbents are stored in 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 40oC, atmospheric pressure. The suction ventilation system of the tank rooms is providing also exhaust gas clean up.

2. RAW MANAGEMENT FACILITIES OPERATED BY SE RAW

2.1 Decommissioning Kozloduy SD

From 2008 Kozloduy NPP Units 1 and 2, die to be decommissioned are declared as facilities for RAW management and are handed over for operation to State Enterprise "Radioactive waste".

In October 2010 licenses for operation of RAW management facilities, due to be decommissioned have been issued to SE raw trough Decommissioning Kozloduy SD.

Since 2012 Kozloduy NPP Units 3 and 4, die to be decommissioned are declared as facilities for RAW management and are handed over for operation to State Enterprise "Radioactive waste".

In February 2013 licenses for operation of RAW management facilities, due to be decommissioned have been issued to SE RAW trough Decommissioning Kozloduy SD.

In the facilities are performed activities related to extraction, storage, processing and transportation to site of a "historical" operational and secondary RAW until they are transported to RAW Kozloduy SD.

2.1.1 Auxiliary Building-1

Auxiliary building-1 is designed for temporary storage of solid waste category 2 (additional categories 2-I and 2-II), low and intermediate level liquid radioactive concentrates, and spent sorbents from the reactors operation.

The waste is stored in a building with reinforced structure, separated part of auxiliary building – 1 (AB-1) serving units 1 and 2.

The solid RAW are stored in premises of bunker type with upper cylindrical 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 liquid radioactive waste is stored in 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 spent high level sorbents are stored in 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 spent low-active sorbents category 2 (additional categories 2-N) are stored in two tanks, 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 equipped with a leakage control system. The suction ventilation system of the tanks rooms provides for gas clean up.

2.1.2 Auxiliary Building -2

Auxiliary building-2 is designed for temporary storage of solid RAW category 2 (additional categories 2-I and 2-II), low and intermediate level liquid radioactive concentrates and spent sorbents from the reactors operation.

They are stored 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

2.1.3 At reactor storage in Reactor Hall 1 (RH-1)

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

It's located in the reactor hall of Units 1 and 2.

The storage facility is tube-type. 400 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.

2.1.4 At reactor storage in Reactor Hall 2 (RH-2)

It is designed for temporary storage of solid RAW category 2-III from the operation of reactors.

It's located in the reactor hall of Units 3 and 4.

Its characteristics are the same as of the Reactor Hall of Units 1 and 2.

2.2 RAW –Kozloduy SD

It is located at the Site of Kozloduy NPP and includes:

2.2.1 RAW processing plant

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

The conditioning technology by cementing includes:

- extraction of the liquid RAW from the KNPP tanks for liquid radioactive concentrate;
- transport to the RAW processing plant (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

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:

2.2.1.1 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;
- Lidding machine for 210 litres drums;
- Drum scanner (spectrometry);
- 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.

2.2.1.2 Line "Liquid RAW"

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

- Specialised tank truck for transport of the radioactive concentrate;
- 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 ;
- Silos for cement and chemical additives;
- Feeders and batcher for cement and additives;
- Mixer;
- Pumps, tanks, etc.

RAWPP is equipped with all the necessary auxiliary systems and external connectors.

2.2.1.3 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, sewage and neutralization of solutions;
- Tanks, transport and lifting equipment

2.2.2 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 structure which provides the necessary engineering barriers for the stored RAW. Its capacity is 1920 RAW packages - reinforced concrete containers with conditioned RAW (960 in both sectors "A" and "B", in 4 levels). 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.

2.2.3 Site "Lime Plant"

A site where the following objects are located:

2.2.3.1 Trench Storage facility

It is designed for temporary storage of unprocessed and processed solid RAW of category 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.

2.2.3.2 Storage facility for processed solid RAW

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

The storage facility is, reinforced concrete 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.

2.2.3.3 Sites (№1 and №2) for storage of solid RAW in reinforced concrete containers

They are designed as buffer storage of processed solid RAW of category2-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 category 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 immobilized in cement matrix solid RAW, in accordance with Design modification No. RAW TR-02/11.07.01.

2.2.3.4 Site for storage of solid RAW in freight containers

It is designed for buffer storage of low-active solid RAW category 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.

2.2.3.5 Storage 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.

2.3. 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 includes:

2.3.1 Solid RAW Storage Facility

For storage of non-conditioned solid low and intermediate level short-lived RAW (2a category). 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 cm. according to the design, after the fulfilling of the cages, they could be grouted with concrete.

2.3.2 Biological RAW Storage Facility

For storage of conditioned by stabilization in the gypsum matrix of pre-treated with formaldehyde biological RAW, low and intermediate level short-lived category 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.

2.3.3 Spent Sealed Sources Storage Facility

For storage of non-conditioned low and intermediate level sealed sources category 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.

2.3.4 Engineering trench for solid RAW

For non-conditioned solid low and intermediate level short lived solid waste category 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.

2.3.5 Storage for liquid RAW

For storage of unprocessed low and intermediate level liquid RAW category 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.

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

For of solid waste category 2a and 2b stored in freight ISO- standard containers. Fire alarm detectors in transport packages, solid RAW and spent sources with low specific activity, which do not require additional protection, neutron sources and a-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 m3 total volume.

2.3.7 Site No. 2 for storage of solid RAW

For storage of solid RAW category 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.

2.3.8 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.

2.3.9 Complex for processing of RAW

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

- System for treatment of liquid radioactive waste;
- System for Cementation of liquid and solid waste;
- In-drum compaction system for solid RAW (200 l drums);
- RAW abrasive decontamination system;
- Ventilation and acclimatization system;
- Compartments for sorting of RAW;
- Compartments for fragmentation of solid RAW;
- Compartments for pre-treatment of RAW;
- Three buffer storage places;
- Laboratory complex.

3. RAW MANAGEMENT FACILITIES OPERATED BY INRNE – RESEARCH REACTOR IRT-2000

3.1 Storage for reactor equipment

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 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 RCC

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 MANAGEMENT OF RAW FROM 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 million m^3 and is fulfilled, comparatively well compacted and partially recultivated.

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 million 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 m^3 to 2100 m3 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 includes 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 / 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 the line is 0.5 m^3/h regenerated resins.

The technological scheme 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 sulphur acid solution;
- water extraction of uranium from the regenerating solution;
- re-extraction of the uranium and processing of the solution to produce solid $NH_4UO_2(CO_3)_3$.

Annex L-4

RADIOACTIVE WASTE INVENTORY

1. RAW MANAGEMENT FACILITIES OPERATED BY KOZLODUY NPP

1.1 Auxiliary building-3

1.1.1. Solid RAW *– Category* ***2a***

Volume of RAW in RAWSF by 31.12.2013 – **547 m^3**

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

Processed waste – 2603 pcs of 210 litter – drums

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

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

1.1.2 Solid RAW – Category **2**, Additional Category 2-III

Volume of RAW by 31.12.2010 – **18 m^3,** Physical components – Mainly metal RAW

1.1.3 Liquid RAW

Liquid radioactive concentrate - Category 2a, Additional Category 2-C

Volume of RAW by 31.12.10 – **1675 m^3**

General description - Liquid radioactive concentrates with total salt content 80 ÷ 355 g/l, boron acid concentration 17 ÷ 63 g/l, pH 8 ÷12. Presence of precipitated solid phase, mainly sodium borates and sludge.

Radionuclide composition: ^{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.

1.1.4 Spent sorbents - Category **2a**

Volume of RAW by 31.12.2010 - **135 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. Physicochemical characteristics are similar to those of the initial sorbents, used during the operational period of the units. Proportion – about 70% vol. sorbent and about 30% vol. water.

Radionuclide composition: ^{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.

2. RAW MANAGEMENT FACILITIES OPERATED BY SE RAW

2.1 Decommissioning Kozloduy SD

2.1.1 Auxiliary building-1

2.1.1.1 Solid RAW - Category 2a, Additional Categories 2-I и 2-II

Volume of RAW by 31.12.2013 - **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	-

2.1.1.2 Liquid RAW

Liquid radioactive concentrate - Category 2a, Additional Category 2-C

Volume of RAW by 31.12.2013 - **2000 m^3**

General description – Liquid radioactive concentrates with total salt content 28 - 35 %, boron acid concentration up to 4%, pH 7-9 for the different tanks. Presence of precipitated solid phase, mainly sodium borates and sludge.

Radionuclide inventory: The following radionuclides are detected in the decant: ^{134}Cs, ^{137}Cs, ^{60}Co, ^{54}Mn, ^{58}Co and ^{110m}Ag. 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 - 2.10^6 Bq/l, ^{137}Cs - 1.10^6 - 4.10^7 Bq/l, ^{60}Co -3.10^4 - 1.10^6 Bq/l.

2.1.1.3 Spent Sorbents - Category 2

Volume of RAW by 31.12.2013 - **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 during the operational period of the units. Proportion – about 70% vol. sorbent and about 30% vol. water.

Radionuclide inventory:

Spent sorbents in БНС of АВ-1: ^{134}Cs - $1.10^5 \div 9.10^5$ Bq/kg, ^{137}Cs - $6.10^6 \div 3.10^7$ Bq/kg, ^{60}Co - $1.10^5 \div 5.10^6$ Bq/kg.

The radionuclide inventory of RAW in the БВС includes the same radionuclides with the following activities: ^{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.

2.1.2 Auxiliary Building-2

2.1.2.1 Solid RAW - Category 2a, additional categories 2-I и 2-II

Volume of RAW by 31.12.2013 - **320 m^3**

Physical components (vol %) - textile (4%), metal (1%), filings (1%), wood (4%), construction wastes (0%), polymers (42%), wadding (1%), rubber (0%), paper (0%), mixed (47%).

Processed waste – 1313 200 litter - drums

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

2.1.2.2 Liquid RAW

Liquid radioactive concentrate - Category 2a, additional category 2-C

Volume of RAW by 31.12.2013 – **1690 m^3**

General description - Liquid radioactive concentrates with total salt content 8÷35 %, boron acid concentration 20÷75 g/l, pH 7÷9 for the particular tanks. Presence of precipitated solid phase, mainly sodium borates and sludge.

Radionuclide inventory: 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 - $1.10^4 \div 2.10^6$ Bq/l, ^{137}Cs - $6.10^6 \div 4.10^7$ Bq/l, ^{60}Co - $6.10^4 \div 1.10^6$ Bq/l.

2.1.2.3 Spent Sorbents - Category 2a

Volume of RAW by 31.12.2013 - **240 m^3** (БВС - 110 m^3; БНС - 130 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 during the operational period of the units. Proportion – about 70% vol. sorbent and about 30% vol. water.

Radionuclide composition: The radionuclide inventory in БНС is: ^{134}Cs - $4.10^5 \div 6.10^5$ Bq/kg, ^{137}Cs - $6.10^5 \div 4.10^7$ Bq/kg, ^{60}Co - $3.10^5 \div 9.10^6$ Bq/kg.

The radionuclide inventory in the БВС includes the same radionuclides with the following activities: ^{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.

2.1.3 At reactor storage in Reactor Hall 1 (RH-1)

2.1.3.1 Solid RAW - Category 2**,** additional category 2-III, with dose rate 10 mSv/h at the surface

Volume of RAW by 31.12.2013 - **52 m^3**

2.1.4 At reactor storage in Reactor Hall 2 (RH-2)

2.1.4.1 Solid RAW - Category 2**,** additional category 2-III with dose rate over 10 mSv/h at the surface; **Volume RAW** by 31.12.2013 - **32 m^3**

2.2 RAW Kozloduy SD

2.2.1 Storage facility for conditioned RAW.

Solid RAW - Category **2**a, additional categories 2-I and 2-II

Number of packages, stored by 31.12.2013

Packages of conditioned RAW, type	*Number of packages*
RCC-1	296
RCC -3	985
RCC -2	87
Total	**1368**

Radionuclide content of the conditioned RAW in RCC-1, [Bq/kg]:

^{54}Mn - 1.10^{1}	^{134}Cs - 2.10^{3}
^{60}Co – 4.10^{4}	^{137}Cs - 4.10^{4}
^{110m}Ag - 1.10^{1}	

Radionuclide content of the conditioned RAW in RCC-3, [Bq/kg]:

^{54}Mn - 4.10^{3}	^{110m}Ag - 2.10^{3}
^{57}Co - 3.10^{2}	^{134}Cs - 5.10^{5}
^{60}Co - 2.10^{5}	^{137}Cs - 2.10^{7}

Radionuclide content of the conditioned RAW in RCC-2, [Bq]:

^{54}Mn - 8.10^{8}	^{110m}Ag - 3.10^{8}
^{59}Fe - 3.10^{8}	^{134}Cs - 9.10^{8}
^{57}Co - 1.10^{7}	^{137}Cs - 3.10^{10}
^{60}Co - 7.10^{10}	^{95}Nb - 2.10^{5}

2.2.2 Trench storage facility

Solid RAW - Category 2a, additional categories 2-I and 2-II

Volume of RAW by 31.12.2013 – **2334,77 m^3**

Physical components (vol %) of non-treated RAW – Textile (19,32%), Metal (13,41%), Filings (0,16%), Wood (6,37%), Construction wastes (7,53%), Polymers (1,16%), Wadding (7,47%), Rubber (0,18%), Paper (0,01%), Mixed (44,39%).

Processing	Stored Waste (vol. %)	Volume Reduction Factor of the initial RAW
Pre-compaction	-	-
Super-compaction	71	7
Packing	-	-
Not treated	29	-

Radionuclide composition of the treated RAW, [Bq/kg]:

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

2.2.3 Storage facility for processed solid RAW

Solid RAW - Category 2a, additional categories 2-I and 2-II

Volume of RAW by 31.12.2013 – **326,60 m^3**

Physical components (volume %) - Textile **(**8%**)**, Metal (29%), Construction wastes (20%), wadding (14%), Mixed (29%).

Processing	Processed Waste (vol. %)	Volume Reduction Factor of the initial RAW
Pre-compaction	-	-
Super-compaction	100	7
Packing	-	-
Not treated	-	-

2.2.4 Sites (№1 и №2) for storage of solid RAW in reinforced concrete containers

Solid RAW - Category 2a, additional categories 2-I and 2-II

Number of packages, stored by 31.12.2013 - RCC-2 **- 279** pcs. At Site № 2

Physical components (volume %) - 200l drums with solid RAW**,** super compacted and immobilised in concrete non-radioactive matrix.

Radionuclide composition, [Bq]:

^{54}Mn - 3.10^{8}	^{134}Cs - 2.10^{9}
^{60}Co - 4.10^{10}	^{137}Cs - 5.10^{10}
^{110m}Ag - 1.10^{8}	

2.2.5 Site for storage of solid RAW in freight containers

Solid RAW - Category 2a**,** additional category 2-I, **Volume of RAW** by 31.12.2013 - **180 m^3**

Physical components (volume %) - Metal (38%), Construction wastes (62%).

Processing	Processed Waste (vol. %)	Volume Reduction Factor of the initial RAW
Pre-compaction	70	3
Super-compaction	-	-
Packing	-	-
Not treated	30	-

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

$^{54}Mn – 2.10^{2}$	^{134}Cs - 3.10^{3}
^{60}Co - 1.10^{4}	^{137}Cs - 9.10^{3}

2.3. RAW - Novi Han SD

***2.3.1 Solid RAW Storage Facility* -Volume** of the stored RAW by 31.12.2013 - **80 m^3**.

Radionuclide	**Activity, Bq**
H-3	1.10^{11}
C-14	4.10^{11}
Co-60	2.10^{11}
Sr-90	6.10^{11}
Cs-137	3.10^{12}
Total Activity:	**4.10^{12}**

***2.3.2 Biological RAW Storage Facility* - Volume** of the stored RAW by 31.12.2013 - **64 m^3**.

Radionuclide	**Activity, Bq**
H-3	5.10^{9}
C-14	1.10^{10}
Co-60	2.10^{9}
Sr-90	1.10^{10}
Cs-137	8.10^{10}
Total Activity	**2.10^{11}**

***2.3.3 Disused Sealed Sources Storage Facility*-Volume** of the stored RAW by 31.12.2013 - 0,65 m^3.

Radionuclide	**Activity, Bq**
Co-60	1.10^{12}
Sr-90	5.10^{10}
Cs-137	4.10^{13}
Ra-226	6.10^{11}
Pu-239	2.10^{11}
Total Activity	**5.10^{13}**

***2.3.4 Engineering trench for solid RAW*-Volume** of the stored RAW by 31.12.2013 - 160 m^3.

Radionuclide	**Activity, Bq**
Co-60	4.10^{10}
Sr-90	1.10^{11}
Cs-137	5.10^{11}
Total Activity	**6.10^{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.

2.3.5 Liquid RAW Storage Facility

Volume of the stored liquid RAW by 31.12.2013 – 25,2 m^3.

Radionuclide	Activity, Bq
Co-60	2.10^6
Cs-137	4.10^7
Sr-90	1.10^7
H-3	8.10^7
Alpha -emitters	3.10^5
Total Activity	**1.10^8**

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

Volume of the stored solid RAW by 31.12.2013 - 215 m^3, in 13 pcs standard freight containers.

Radionuclide content of the stored RAW by 31.12.2013

Radionuclide	Activity, Bq
Am-241	3.10^{11}
Am-Be	1.10^{12}
Ba-133	1.10^4
C-14	2.10^9
Cl-36	5.10^9
Cm-244	6.10^9
Co-57	5.10^7
Co-60	3.10^{12}
Cs-137	3.10^{10}
Kr-85	2.10^{11}
Pu*	2.10^{12}
Pu-239	5.10^{10}
Pu-Be	2.10^{12}
Ra-226	1.10^7
Sr-90	1.10^{11}
U-238	2.10^{10}
***Total Activity*:**	**1.10^{13}**

2.3.7 Site №2 for storage of solid RAW

Radionuclide content of the stored RAW by 31.12.2013

Radionuclide	Activity, Bq
Am-241	3.10^{12}
C-14	9.9^{10}
Co-60	1.10^{15}
Cs-137	2.10^{15}
Pu-Be	1.10^{09}
Pu*	8.10^{10}
Ra-226	6.10^{10}
Sr-90	1.10^{11}
Total Activity	3.10^{15}

2.3.8 Site No. 4 for storage of low active RAW

Radionuclide content of the stored RAW by 31.12.2013 – **76,4 m^3**.

Radionuclide	Activity, Bq
Am-241	9.10^9
Cm-244	8.10^9
Pm-147	2.10^9
Co-60	3.10^{13}
Cs-137	3.10^{12}
H-3	2.10^9
Pu*	3.10^8
Sr-90	2.10^9
Ra-226	9.10^8
Total Activity	3.10^{13}

3. INRNE - BAS

3.1 Reactor equipment Storage Facility

Solid RAW - Category **2a**

Quantity of RAW by 31.12.2013 – 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.

Treatment

Treatment performed – sorting in 6 drums (200 1)

3.2 Site for storage of solid RAW in RCC containers

Solid RAW - Category **2a**

Quantity RAW by 31.12.2013 – 9850 kg.

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

Treatment

Packaging of 6 containers type RCC

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

4. Uranium mining sites

4.1 Tailings pond Buchovo – 1

Quantity of deposited RAW - 1.3 million m^3 tailings.

4.2 Tailings pond Buchovo – -2

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

4.3 Tailings pond Eleshnitsa

The quantity of the deposited RAW is 9.0 million tonnes tailings, including 7.680 million tons solid waste, 1700 m3 spent ion-exchange resins and unspecified quantity of solid RAW from 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 I II, (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 17thof 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 29 th 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 innuclear 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.

Annex L-6

HUMAN AND FINANCIAL RESOURCES IN THE MANAGEMENT OF SF AND RAW

I. Human Resources

Pursuant to the requirements of the ASUNE, the management of radioactive waste and spent fuel is performed only after obtaining a permit and/or a license from the Nuclear Regulatory Agency for the safe conduct of this activity.

The licensees are fully responsible for ensuring the safety of the facilities and activities. The responsibilities of the organizational units and the responsible officials in the Kozloduy NPP during operation of the nuclear facilities are clearly assigned and documented.

In fulfilling of these requirements of the ASUNE, the licensees have a developed and functioning system for the selection and training of personnel.

To provide qualified and competent personnel a selection system is applied that requires the following, namely:

- Checking the health status and permission to work in an environment of ionizing radiation, which is operated by its own occupational health service;
- Conducting of psychophysical examinations for establishing compliance of the personal qualities of the candidates for operational personnel, working with RAW and SNF with the necessary requirements for occupying the position in question and issuing a certificate for suitability - performed by qualified psychologists. The Ministry of Health renders a methodological guide for this process.
- Conducting of professional selection - checking the compliance of the applicants with the requirements of the job description for the level of education, the acquired specialty guaranteeing a minimum of acquired knowledge and the required working experience.

The job descriptions have been prepared in accordance with the Regulation on the conditions and order for acquiring professional qualification and the order for issuing licenses for specialized training and certificates for qualification for the use of nuclear energy and include the functions related to the safe operation of nuclear facilities, the minimum necessary knowledge in the field of the use of nuclear energy, nuclear safety and radiation protection and the necessary qualification.

To implement the specialized training and to maintain the qualification of the personnel, the Kozloduy NPP has its own Training Centre and holds a license for specialized training.

The activities on management of RAW and SNF are provided with a sufficient number and qualified personnel. The specific positions, the number and the required minimum degree for the holding the position are determined in the adopted job description lists of the licensees.

As of March 2013 the personnel of units 3 and 4 of the Kozloduy NPP was transferred to the SE RAW - SD "RAW management units 3 and 4."

As of the beginning of 2014, the personnel of units 1 to 4 has been included in the structure of the SE RAW - SD "Decommissioning".

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 provision and maintenance of safety in the facilities for management of SF and RAW are financed from various sources, as follows:

Own resources

The expenditure of the Kozloduy NPP for the management of SF, for its storage, transportation and technological processing in Russia are recognized as an expense in determining the price of electricity by the regulatory authority in this field - the State Energy and Water Regulatory Commission. Accordingly, these costs are financed with own funds - from the proceeds from the sale of electricity.

The unspent funds recognized in the pricing during the current year, are provisioned for. The management of these funds is as follows – they are deposited in a targeted account opened by the Kozloduy NPP in a bank and under conditions approved by the MEE. The accumulated funds in the account shall be used only to cover the cost of transportation activities, technological storage and reprocessing the SF, left unimplemented from previous years.

Fund RAW and Fund Decommissioning

The order for collecting and spending the financial resources in the funds is defined in the *Regulation on the order for assessment, collection, spending and control of the funds and on the amount of contributions to the fund RAW* and the *Regulation on the order for assessment, collection, spending and control of the funds and on the amount of contributions to the fund Decommissioning*.

After the presentation of the fourth national report there have been no changes in the methodology for determining the amount of monthly instalments which the Kozloduy NPP has to deposit in both funds. For the period from January 1, 2011 to June 30, 2014, the contributions of the Kozloduy NPP in the funds and the expenditure are as follows:

Fund RAW – contributed/spent financial resources by the Kozloduy NPP in BGN		
Years	Contributed	Spent
2011	25 127 843	0
2012	24 169 127	0
2013	21 728 170	0
From 01.01.2014 until 30.06.2014	12 170 731	0
Total for the period:	83 195 871	0

Fund Decommissioning – contributed/spent financial resources by the Kozloduy NPP in BGN		
Years	Contributed	Spent
2011	62 819 608	0
2012	60 422 819	894 834
2013	54 301 369	5171
from 01.01.2014 until 30.06.2014	30 426 827	0
Total for the period:	207 970 623	900 005

SE RAW

The activities on management of RAW and the preparation for decommissioning are financed by the Fund "RAW" and the International Fund "Kozloduy".

After the presentation of the fourth national report no changes in the structure and operation of the International Fund "Kozloduy" have taken place. Below are presented the expenditure costs as per years until 31.12.2013.

Year	From fund RAW	From International Fund Kozloduy	Total
2011	28 308 480	5 611 215	33 919 695
2012	28 145 533	7 738 878	35 884 411
2013	29 133 301	31 370 964	60 504 265
Total for the period:	**85 587 314**	**44 721 057**	**130 308 371**

Annex L-7

Classification of RAW according to the Regulation for safety of RAW management

1. Category 1 – transitional RAW, which can be released from control after appropriate processing and/or after a temporary storage for a period no longer than 5 years, when activity had decreased under the levels for release from control

2. Category 2 – low and intermediate activity wastes, containing radionuclides in such concentrations that no special measures for afterheat removal are necessary during the storage and disposal; the radioactive wastes in this category are additionally categorized as:

a) Category 2a – short lived low and intermediate activity wastes, containing mostly short-lived radionuclides (with half-life shorter or equal to that of Cs-137) and long-lived alpha nuclides with specific activity, less than or equal to 4.10^6 Bq/kg for a single package and less than or equal to 4.10^5 Bq/kg for the entire volume of RAW.

b) Category 2b – long-liver low and intermediated activity wastes, containing long-lived alpha nuclides (with half-life shorter or equal to that of Cs-137) with specific activity exceeding the limits of the category 2a.

3. Category 3 – high level activity wastes, in which the concentration of the radionuclides is such that the heat release should be considered in the storage and disposal.

For the RAW management purposes before disposal, the RAW generation entities can introduce additional categories, which are subject of review by the regulator. Such additional categorisation, focused on the specific of the methods applied for RAW manipulation and processing, has been introduced in the Kozloduy NPP and SD RAW –Kozloduy.

2-I – from 1μSv/h to 0.3 mSv/h;

2-II – from 0.3 mSv/h to 10 mSv/h;

2-III – above 10 mSv/h.

For the liquid RAW, the following additional categories, depending on the total specific activity:

2-H – less than 4.10^5 Bq/l;

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

2-B – above 8.10^7 Bq/l.