ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE FACILITY FOR TREATMENT AND CONDITIONING OF RADIOACTIVE WASTE WITH HIGH VOLUME REDUCTION FACTOR AT KOZLODUY NUCLEAR POWER PLANT

NON-TECHNICAL SUMMARY

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USED ABBREVIATIONS AND ACRONYMS

AB-2	Auxiliary building 2
ALARA	As Low As Reasonably Achievable
BAS	Bulgarian Academy of Sciences
BAT	Best available techniques
BEEA	Bulgarian Executive Environment Agency
BEPA	Bulgarian Environmental Protection Act
BNRA	Bulgarian Nuclear Regulatory Agency
BRPN	Basic radiation protection norms
CA	Controlled area
CED	Collective effective dose
CMD	Council of ministers decree
CPF	Cellulose and paper factory
DECO	Decommissioning
EBRD	European Bank for Reconstruction and Development
EC	European commission
EIAR	Environmental impact assessment report
EU	European Union
EWN	Energiewerke Nord (German company)
HVRF	High volume reduction factor
IAEA	International Atomic Energy Agency
IP	Investment proposal
ISAR	Intermediate safety analysis report
KIDSF	Kozloduy international decommissioning support fund for Units 1-4
KNPP	Kozloduy Nuclear Power Plant
KPMU	Kozloduy project management unit
LLA	Long-lived Aerosols
MA	Monitored area
MDA	Minimum detectable activity
MEW	Ministry of Environment and Water
MV	Motor vehicle
NRSF (NDF)	National disposal facility for low and intermediate radioactive waste
NERSN	National ecological radiation supervision network
NPP	Nuclear Power Plant
NSI	National statistical institute
NTS	Non-technical summary
PA	Protected area
PG-1	Power generation 1 (Units 1-4)
PMF	Plasma melting facility
PT	Protected territory
PT	Plasma torch

PTC	Primary treatment chamber
RAW	Radioactive waste
RCMIW	Repository for conventional municipal and industrial waste
RCC	Reinforced concrete containers
RIEW	Regional inspection of the environment and water
RNG	Radioactive noble gases
ROTPEA	Regulation on the order and terms for performing of environmental assessment
SCC	Slag Collection chamber
SD RAW	Special division “Radioactive waste Kozloduy”
SE	Safe enclosure
SEA	Safe enclosure area
SE RAW	State Enterprise “Radioactive Waste”
SG	State gazette
SSRM	Stations for supervision and radiation monitoring
STC	Secondary treatment chamber
TD	Technical Design
ToR	Terms of Reference
TS	Technical Specification
VRF	Volume reduction factor
VT	Ventilation tube
WWER	Water-Water Energy Reactor
WSS	Water Supply and Sewerage

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1. INTRODUCTION

In November 1999 the Bulgarian government and the EC signed a Memorandum, according to which the Bulgarian government undertook the shutdown and decommissioning of Kozloduy Nuclear Power Plant (KNPP) Units 1-4 as early as possible, starting with the shutdown of Units 1 and 2 until the end of 2002. The engagement to shut down KNPP Units 3-4 until the end of 2006 was undertaken later. As a result the four units were shut down as planned.

Considering the financial consequences of the early shutdown, as well as the necessity of a competitive energy sector, the European Commission gave the Bulgarian energy sector a long-term support package as well as in the nuclear power sector. In this regard, the Kozloduy International Decommissioning Support Fund for Units 1-4 (KIDSF) was set up.

The Frame agreement between Bulgaria and the European Bank for Reconstruction and Development regarding the Kozloduy International Decommissioning Support Fund for Units 1-4 (KIDSF) activities includes Project 5b for building of a Facility for treatment and conditioning of solid radioactive waste with high volume reduction factor at the KNPP site.

The purpose of the KNPP PLC Investment proposal (IP) is to build a “Facility for treatment and conditioning of radioactive waste with high volume reduction factor” at KNPP, which will help to reduce the volume of low and intermediate level radioactive waste (Category 2a) stored prior the IP implementation at the dedicated for this purpose locations at KNPP site .

The Facility for Treatment and Conditioning of Radioactive Waste with High Volume Reduction Factor, called further on Plasma Melting Facility (PMF), will also help ensure enough capacity of the existing RAW storage facilities at the KNPP site until the National RAW Storage Facility (NRSF) is built in 2015. The “Radiana” site where the NRSF will be constructed is located 3 km away from the KNPP site. The commissioning of NRSF, which will be in operation for 60 years, will close the RAW management cycle in Bulgaria, which ensures the RAW safe enclosure. The separate EIA procedure for NRSF has been concluded with a positive EIA decision by the competent authority Ministry of Environment and Water (MEW).

The investment proposal for the PMF construction is based on a technology which is able to treat solid and liquid RAW. In this technology a thermal plasma field is created by directing an electric current through a low pressure gas stream. The following groups of RAW will be treated and conditioned at the PMF:

- RAW generated during operation of Units 1-6 and currently stored at the KNPP site;
- Additional amounts of RAW that are expected to be generated during the stages of the SE Preparation and Operation and as result of dismantling activities during decommissioning of Units 1-4;
- Waste expected to be generated during the on-going operation of Units 5 and 6 as well as during their preparation for future decommissioning.

In application of the existing experience in this area, the PMF will represent an extension of the current NPP activities for RAW treatment and conditioning.

The requirement and will of the Employer is to use the best practice concerning the current industrial technologies. This is essential for minimizing the likelihood of negative PMF impact on the environment and human health and for ensuring their maximal protection.

Based on Decision No 26-PR/2010 by MEW for assessing the necessity of performing an Environment impact assessment, an EIA procedure has been initiated according to Bulgarian Environmental Protection Act (BEPA) and the other regulations included in the decision.

For the purposes of the future KIDSF project P5c is being executed covering the Environmental Impact Assessment (EIA) of the stages of building, operation and decommissioning of the above mentioned PMF.

2. PROPOSED ACTIVITY

The investment proposal subject to EIA is related to the construction and operation of a "Facility for treatment and conditioning of radioactive waste with high volume reduction factor at Kozloduy Nuclear Power Plant EAD".

3. EMPLOYER OF THE INVESTMENT PROPOSAL

The Employer of the Investment Proposal (IP) for building of a "Facility for treatment and conditioning of radioactive waste with high volume reduction factor at KNPP" is Kozloduy Nuclear Power Plant EAD (KNPP) according to MEW directions regarding the EIA procedure.

KNPP produces energy in a safe, effective and ecologically clean manner.

The production safety at KNPP is the main priority of the company. This includes a high level of nuclear safety and radiation protection, ensuring safe and healthy working conditions for the personnel and environmental protection. Realizing its responsibility to the environmental situation at present and in the future, the plant observes all safety standards for radioactive waste (RAW) and spent nuclear fuel (SNF) management. The SNF is stored in special spent fuel storage ponds (SFSP) and in the constructed storage facility at the plant site. An enterprise for processing, conditioning and storage of low and medium level RAW operates at KNPP site.

Protecting the environment is an essential element in the policy of the nuclear plant. KNPP operates an automated information system for measuring the gamma background within a 3 km radius around the site. Due to the high safety standards the gamma background at the site area does not exceed the level of the natural background for the period before the plant construction.

Currently, there are 4251 people working at KNPP site.

4. PURPOSES

The purpose of the KNPP Investment Proposal is to build a "Facility for treatment and conditioning of radioactive waste with high volume reduction factor" at KNPP, using plasma technology, which will help to reduce the volume of low and intermediate level radioactive waste (RAW) stored at dedicated for this purposes locations at KNPP site. RAW is stored at several places at KNPP site. In order to minimize monitoring and maintenance at these locations, it is recommended that waste should be transferred and processed in order to minimize its volume.

The Plasma Melting Facility (PMF) will also help to ensure enough capacity of the existing RAW storage facilities at the KNPP site until the National RAW Disposal Facility is built.

The aim of the EIA for the implementation of this investment proposal (IP) is to assess and compare the impacts from the proposed IP corresponding to the alternatives of its implementation in regard to the environment and the people, in accordance with the Bulgarian Environmental Protection Act (BEPA) [1], the

Regulation on the terms and procedure for performing of environmental impact assessment [2], the EC EIA Directive [6], the EBRD social and environmental policy [4].

5. LOCATION OF THE IMPLEMENTATION OF THE PROPOSED ACTIVITY

The IP for building of Facility for Treatment and Conditioning of Radioactive Waste with High Volume Reduction Factor at KNPP will be implemented on the territory of KNPP in an existing building. The total area of the site is approx. 2 km^2 and together with the channels for circulation and technical water supply reaches 4 km^2.

Kozloduy NPP has been constructed in north-western Bulgaria on the right bank of the Danube River 5 km southeast of the town of Kozloduy. KNPP site is located at the 694th km from the Danube estuary at a distance of 3.7 km south from the river midstream and the state border with Romania. The site area is located in the northern part of the first non-flooded terrace of the Danube River at an absolute elevation of +35.00 m. The site area is flat, with an average altitude ranging from +28.00 m to +36.00 m according to the Baltic altitude system. The lowland and the site are protected from the Danube River by an embankment reaching an absolute elevation of +30.40°m. To the north it borders on the Danube Lowland. To the South of the site the slope of the watershed plateau is relatively high (100-110°m), to the West it is about 90 m, while to the East it is relatively lower and goes down to a 30m altitude above the sea level. The Kozloduy Nuclear Power Plant is located at a distance of 120 km (straight line) and 200 km (via motorway) from the City of Sofia. The following municipalities are included in the 30km zone around the site: Kozloduy, Valchedrum, Hairedin, Mizia (entirely) and Lom, Byala Slatina, Oryahovo (partially). A sparsely-populated part of the territory of Romania consisting of 23 settlements – 2 towns (Dabuleni and Bechet) and 21 villages is also included in the 30 km zone around the site (fig. 1). The nearest populated settlements are as follows: Town of Kozloduy – at 2.6 km to the south-west; Village of Harletz – at 3.5°km to the south-east; Village of Glojene – at 4.0 km to the south-east; Town of Mizia – at 6.0 km to the south-east; Village of Butan – at 8.4 km to the south; Town of Oryahovo – at 8.4 km to the east of the site. The regional location of KNPP is shown in fig. 1.

Fig. 1 Regional location of KNPP site

The proposed PMF will be installed at the KNPP site and the proposed location is within Auxiliary Building 2 (fig. 2), in Room BK301 at elevation level +6.30 m and Room BK039/3 at elevation level +0.00 m. The Rooms are connected to the site systems providing: electricity; seam, compressed air, demineralized water, cooling water, nitrogen, and ventilation.

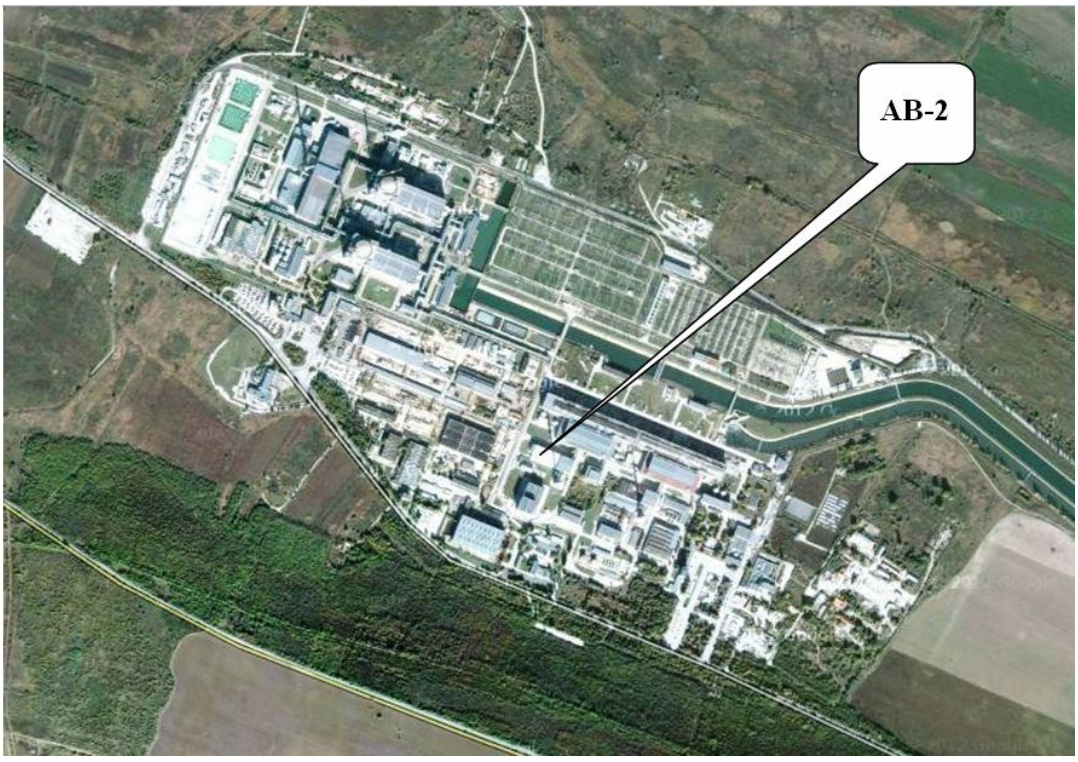

Fig. 2 Location of AB-2 at KNPP site

General Plan of the PMF

AB-2 is a building designed to service KNPP Units 3 and 4 and Room BK301 is currently unused.

The room is approximately 71.3 m in length, 36.4 m in width and approximately 8.45 m in total height and the floor area is served by three cranes of lifting capacities 6.30 t, 4.00 t and 2.00 t. (fig. 3).

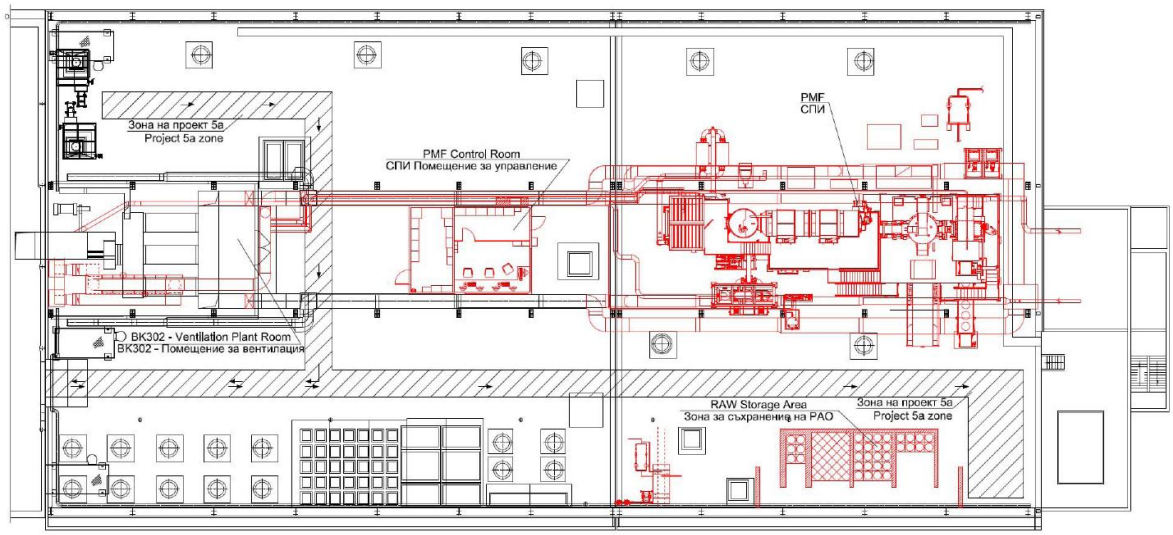

Fig. 3 Plan of AB-2, elevation +6.30 m

The following is considered with reference to the layout of PMF and its components in this room: the range of the existing cranes in view of their use for the needs of the PMF design; the location of the protruding floor parts in Room BK301 (between axes 13 to 19); the roof structure support columns; the ventilation air ducts of the intake-extraction ventilation system of room BK301; the proximity of the existing transportation hatchway in the floor of room BK301, through which RAW will be loaded and unloaded.

Taking into account the existing conditions and infrastructure of the PMF, the design envisages partial reconstruction of room BK301. Such reconstruction is required because of the overall height of some of the PMF modules and the need to provide conditions for installation, maintenance and dismantling activities.

Present and future land users

The territory designated for the needs of building the PMF at KNPP includes the existing site of these units only. Release of control of territories for agricultural or forestry purposes is not expected.

In order to assess the expected impacts on the ecological and anthropogenic elements of the environment and the population, resulting from the IP implementation, the EIA considers the impact areas around KNPP in the 30 km radius monitored area (MA), including the Romanian territories.

PMF description

This section includes a brief technological description of PMF from waste generation to the release of the processed outgoing gases in the atmosphere.

Fig. 4 shows the general PMF location in the AB-2 building.

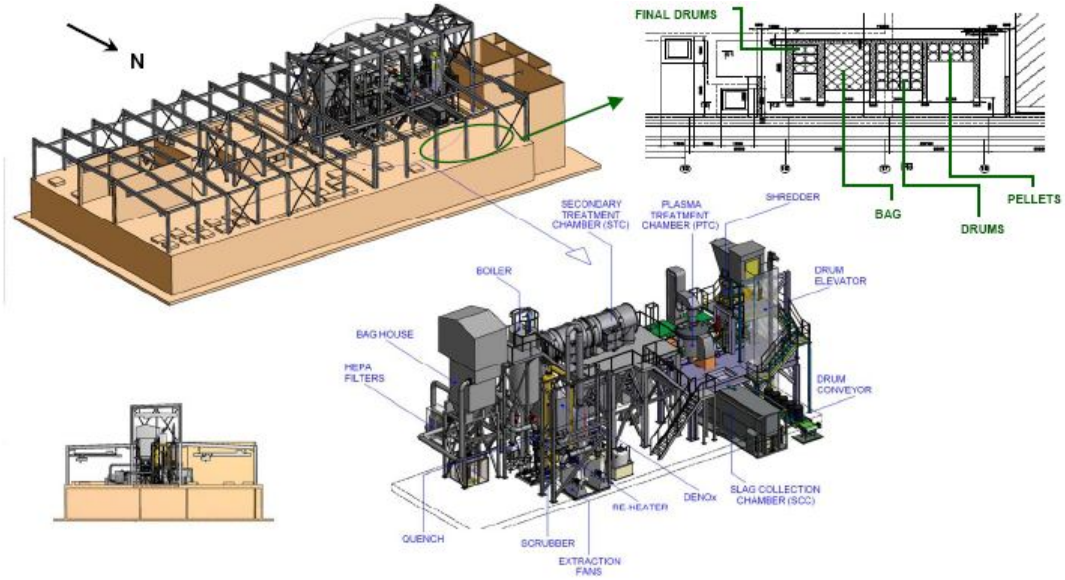

Fig. 4 General PMF location in the AB-2 building

Fig. 5 shows the general flow diagram of the facility. The Plasma System is a high energy technology able to treat a large range of wastes. In plasma technology a thermal plasma field is created by directing an electric current through a low pressure gas stream (air used as plasma gas). The extremely high temperatures in the arc can be used to completely decompose all organic materials to their chemical components by injection in the plasma or using plasma arc as a heating source for burning or pyrolysis.

Untreated waste, pre-compacted waste in 200 l drums and super compacted waste (called “untreated waste” from now on) arrive at AB-2 in KNPP waste containers through the existing lock in AB-2.

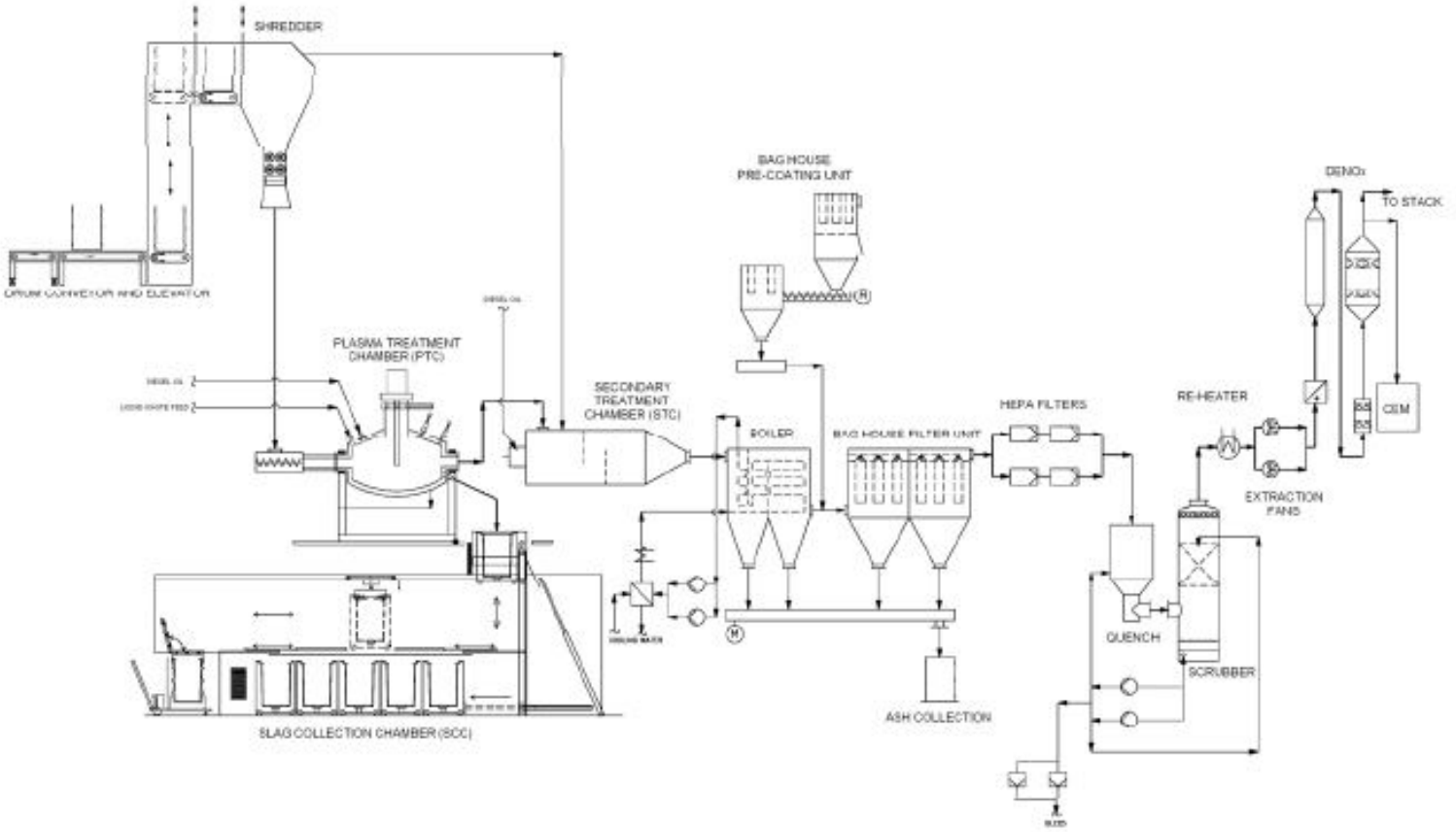

Fig. 5 General technological scheme of the facility

By means of a feeding system the untreated waste is transferred to the shredder unit. The shredder and extrusion tube process the untreated waste into small and relatively uniform material forming a continuous feed to the Primary Treatment Chamber.

The plasma treatment will take place in the Plasma Treatment Chamber (PTC, also named as Primary Treatment Chamber) where the plasma torch is mounted. The PTC is a high temperature (1100°C – 1500°C) tilting furnace (fig.6). Into the PTC the organic material is vaporized in volatile hydrocarbons, carbon monoxide, etc. while non-combustible and other inorganic constituents are melted and transformed into glassy slag. The furnace operates at negative pressure of about 250°Pa and has a good air-tightness.

As no additional air is added to the furnace, organic waste will not burn but rather gasify.

When the PTC is full the feeding s cycle stops and the pouring cycle will start with pouring the slag into moulds preliminary positioned in cooling vessel.. The final waste is further cooled down in the Slag Collection chamber (SCC) where after cooling down the slag mould is placed via an airlock with double cover in a 200 l drum. The 200l drum is transported to a temporary storage facility waiting for the final disposal.

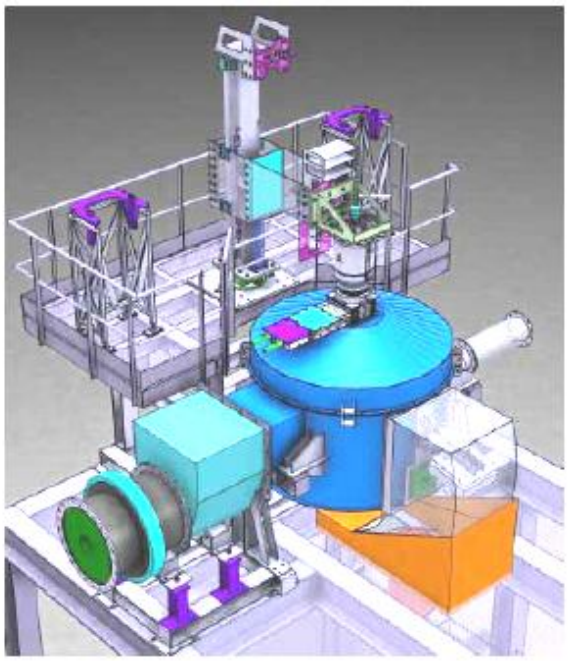

Fig. 6 Primary Treatment Chamber with a burner and console

Secondary treatment chamber (STC). The unburned gases, hydrocarbons, soot particles, CO, hydrogen and fly ash flow from the primary treatment chamber (PTC) to the secondary treatment chamber (STC) for complete combustion to primary oxidized components such as CO_2, SO_2 and H_2O. The STC provides at least two seconds in duration of treatment at the design speed of waste delivery and at minimal temperature of 850°C. The STC torch runs on diesel fuel and switches between strong and weak flame as a function of the temperature at the STC exit.

After the STC the off-gases are directed to a cleaning system. After cooling down the flue gases enter the bag house. Particulate matter (aerosols) is captured by surface filtration of membrane filter bags of Polytetrafluoroethylene (PTFE). The absorbing medium of the filter is cleaned by pulse jets of compressed air triggered by a differential pressure indicator. The collected particles are removed from the surface of the filter elements. The bunker at the bottom of the chamber with bag filters takes the separated particles and the emptying is carried out through a rotary outlet valve, and a vibration conveyer. After passing through the bag filter, the gases enter the unit of HEPA filters.

The wet gas scrubbing assembly, consists of a quencher tower, a counter current scrubbing tower with caustic liquid for removal of HCl and SO2, and a demister. Two extraction fans in parallel ensure the evacuation of flue gases.

After heating up the flue gases, by recuperating heat from the boiler circuit and by an additional electrical heater, NOx concentration is reduced catalytically into the DeNOx system.

The IP documentation declares that the HEPA filters have 99.97 % efficiency, and after the scrubber a 99.995 % can be assumed considering the activity captured in the solid products (slag and ash) and in the liquid products (scrubber water).

According to the PMF design the retaining of radioactivity in the PMF is provided by the equipment limits and by the boxes, as well as by the negative pressure in the system compared to the building. Besides, the box areas where repair activities are performed are periodically cleaned, thus preventing the build-up of radioactive contamination during the entire operation period.

Furthermore, in order to prevent the build-up of too much radioactive contamination and to facilitate the repair activities, the following is also planned:

- Periodical cleaning of the PMF components with a special vacuum cleaner in order to minimize the contamination spreading.

These activities will minimize the residual radioactive contamination within the equipment, thus reducing the risk of contamination spreading.

In all cases, for the locks or covers to be opened for repair or inspection purposes and are considered critical in terms of radioactive contamination spreading temporary fences will be mounted, consisting of aluminum frame and synthetic foil (for example, above the PTC when replacing the refractory lining).

The facility will be equipped with systems for control and management of the different processes. Also, signaling systems are planned in order to avoid emergency situations.

The design term of operation of the facility is at least forty years. Table 1 presents the main PMF characteristics.

Table 1 Main PMF characteristics

Main PMF characteristics	
Performance	**250 t/year**
Feeding rate (per hour)	65 kg solid waste, or 55-60 kg solid waste

Main PMF characteristics	
Performance	**250 t/year**
	and 5-10 kg liquid waste
Flow of flue gases	Nominal/design value: 1200-1400 Nm^3/h
Effective operation	4000 h/year
Specific radioactivity (incoming waste)	Maximal value: $5.17x10^5$ Bq/kg

6. INVESTMENT PROPOSAL ALTERNATIVES

6.1 Location alternatives

The main criterion for the selection of a site for the "Facility for treatment and conditioning of RAW" is the RAW minimal transport distance, i.e. the PMF should be situated near the facilities for management of RAW generated on the same industrial site, at a place designated and licensed by BNRA for such purposes.

Concerning the analysis of other opportunities for PMF location the following considerations can be summarized:

1. Taking into account that the facility will be implemented on the KNPP site it will be part of the NPP territory and thus will be compliant with the requirements of the Bulgarian legislation without effect on the selection of:

- Transport access;
- Area topographic characteristics;
- Soils characteristics;
- Category of land use;
- Microclimate conditions;
- Acquisition and modification of the land use, ownership.

2. The PMF location within the existing AB-2 building is chosen based on technical and economic considerations; the safety of the personnel and the minimal impact on the environment and the population in the area has also been considered. The interconnections among all stages of RAW generation and management have also been taken into account.

3. This area is suitable, since it has already been designated and licensed for RAW storage and has been connected to the AB-2 own existing drainage and ventilation systems. Thus, the necessary operational status will be achieved by connection to the existing KNPP supply infrastructure.

4. The PMF location in AB-2 (on the second floor) is not related with acquiring new land for the IP implementation.

6.2 Transportation alternatives

RAW transportation on the territory of KNPP is not subject to special licensing, since it is a part of the common licenses covering the KNPP territory.

The found optimal route for transportation of incoming RAW generated during decommissioning is proposed to be used, so that the requirement under Article 39 from the Regulation for safety during RAW management [16] are fulfilled, according to which the choice of a site for the facility should minimize the need for RAW transportation, while at the same time the requirements under Article 38 from the same Regulation are fulfilled.

The PMF will receive waste from: Lime farm, RAW processing workshop, RAW Size reduction and decontamination workshop.

The conditioned RAW slag mould obtained by plasma arc in order to reduce the waste volume will be placed in 200 l drums. These drums will be transported to SD RAW from where they will be transferred to the NRSF after they have been placed and cemented in RCCs.

6.3 Technology alternatives

Alternative 0: Non realization of the investment proposal

The Zero-solution (do nothing) related to the current situation means that the wastes are not treated to get a high volume reduction factor and therefore it is not necessary to carry out any civil works concerning the modifications of AB-2.

Considering all processing of the operational RAW and the generation of fresh RAW during decommissioning, the storage facility for the RCCs with the conditioned radioactive waste is not going to have sufficient capacity to hold all the waste to be processed over the foreseeable future before an off-site facility becomes available. Therefore, a technology able to reduce the volume of existing and new waste is necessary.

The Zero Alternative is not acceptable in the context of the implementation of the activities of the continuous dismantling during decommissioning of Units 1-4 at KNPP.

Alternative 1: Other technological options for achieving high volume reduction factors

The only other technological option to achieve a high volume reduction factor, besides the proposed treatment technology (PMF), is the implementation of a conventional incinerator. This can be only feasible if the untreated, pre-compacted and/or super-compacted waste is pre-treated and sorted out into burnable and not burnable material.

This alternative will require a higher level of commitment by the operators; it will create more risk for contamination spreading on the site area and is highly time consumable due to the sorting procedure.

Furthermore, the implementation of this alternative requires redesigning another building within KNPP for the installation of the incineration facility or constructing a new building for the incineration plant.

Alternative 2: Plasma Melting Facility (PMF) for achieving high volume reduction factors

The technology proposed to be used for the PMF is based on plasma arch melting, which is a high energy technology.

The advantages of the proposed PMF are:

- All operational waste existing in KNPP can be treated in one central facility.
- The waste can be treated in a single process without the need of

additional sorting infrastructure.

- A volume reduction factor higher than 50 for not pre-compacted waste, higher than 10 for pre-compacted waste and higher than 2 for super compacted waste is guaranteed.
- The produced waste packages are free from any organic material and suitable for long term storage and disposal without further treatment.
- The waste drums are fed unopened, virtually eliminating the risk of direct radiation exposure and contamination risks to personnel.
- The necessary operational flexibility to treat not only the listed waste but also waste arising during the overall decommissioning process.

The industrial experiences with this proven technology related to the consideration of the Best Available Techniques (BAT) can be seen in Chapter 11, Section 11.3 of EIAR.

7. EIAR ELABORATION PROCEDURE

The EIA procedure in Bulgaria is regulated by the Environmental Protection act and the Regulation on EIA, and regarding this project it includes the following stages:

- Notification of the competent authority and the affected population from the relevant municipality, in this case the Kozloduy municipality, of the investment proposal.
- Assessment of the need of EIA by the competent authority, in this case MEW.
- Development of ToR for determination of the EIA scope and content.
- Assessment of impacts and development of EIA Report (EIAR).
- Public discussion of EIAR.
- EIA decision by the MEW Supreme Expert Environmental Council.

Notification of the competent authority – MEW and the affected population from the Kozloduy municipality of the investment proposal

The Kozloduy Municipality has been notified along with the competent authority of the KNPP investment proposal. During these initial consultations the probable significant impacts from the project have been determined, their spatial distribution (area of impact) and duration, the existence of specific sensitive receptors and others. Based on the information gathered in the process of these consultations the ToR for determination of the EIA scope and content have been developed.

Assessment of the need of EIA

The present EIAR, including the Compatibility Assessment Report (CAR), are developed based on the assessment made by MEW of the need of EIAR and CAR for the "Facility for treatment and conditioning of radioactive waste with high volume reduction factor" at KNPP".

Determination of the EIA scope and content

The quality of the EIA depends largely on the successful and timely determination of the investigation scope. Regarding this project consultations with many stakeholders have been made at this stage: the competent authority for decision-making regarding EIA, specialized state organizations, departments and agencies, concerned public and NGOs.

The ToR for determination of the EIA scope and content provides the vision of the Employer about the nature of the IP, as well as the potentially expected impacts on the environment. Thus the Employer consults with the competent authority, the concerned public, NGOs, government and specialized organizations how and what is planned to be considered in the EIAR in terms of impact factors and components of impact on the environment. The letters to the above-mentioned departments include the key factors that should be considered, analyzed and assessed in the EIAR.

The ToR has been submitted to the competent authority for review, comments and consultations. Thus MEW also performs intermediate control in the process of EIA.

A transboundary EIA procedure has been initiated and a notification of the IP has been sent to Romania, as a stakeholder in the transboundary EIA convention. Upon

receiving of the notification, the Romanian government decided to participate in the EIA procedure. The process of coordination of the EIA scope and content reflects the general and specific Romanian requirements, which have been included in the report.

Assessment of impacts and development of EIA Report (EIAR)

The EIAR has been developed according to the Bulgarian regulations and the requirements of the ToR [7]. The methodology has been described in detail in Chapter 5 of EIAR.

The results from the consultations made in the EIA process are considered in the EIAR and are summarized in Chapter 7 of the Report.

Public discussion of EIAR

The consultations over the EIAR ToR continue in the period of EIAR development. Comments and opinions by the above-mentioned participants in the EIA procedure are accepted during the stage of public access as well as during the public discussion.

If during the stage of public discussion new questions or opinions on the IP arise, the Employer will provide answer to the submitted comments and opinions within the normatively regulated period by presenting the answer to the competent authority, so that the comments and opinions will be taken into account when taking the decision on EIA by the Expert Environmental Council.

EIA decision

The decision is taken by the Supreme Expert Environmental Council based on the conclusions by the experts who have developed the EIAR.

8. ASSESSMENT OF THE EXPECTED IMPACTS ON THE ENVIRONMENT AND THE PEOPLE AS A RESULT OF THE CONSTRUCTION, OPERATION AND DECOMMISSIONING OF THE PMF AT KNPP

8.1 Methodology

The main methods for assessment of the environment factors are the system-ecological analysis and synthesis of data, facts and literature on the issues related to the IP. When summarizing the data and conclusions the current normative documents (laws, regulations, rules, procedures and others) have been applied according to the Bulgarian legislation, as well as the European and international regulations, procedures and guidelines related to the specifics of the decommissioning of nuclear facilities, and the requirements of the European Bank for Reconstruction and Development (EBRD).

In line with the above the following activities have been performed: visit and field study; analysis of map schemes; analysis of the currently available design documentation for the project; analysis of the scientific literature; comparative analysis with the regulations and approved procedures; synthesizing the results of analysis and preparation of expert evaluation.

The impact assessment is based on the thorough knowledge of the current state of the environment in the area of IP implementation. Detailed investigation of the existing conditions has been conducted including review of the available information and data on the state of the environment and conducting of field studies for gathering of additional data, specific for the project, and verification of the existing data.

Based on the impact assessment, the planned mitigation measures and the results from the consultations with the stakeholders a Plan for management of the environment has been developed (see Section 6.2 from EIAR).

8.2 During PMF construction

This section gives quantitative assessment of the direct impacts during building of PMF; the described impacts are related to the main PMF data.

The main impacts during PMF construction will be non-radiation and related to air pollution by exhaust gases from the internal combustion engines (ICE) of the machinery performing the construction and transportation activities. Construction waste will be generated during the construction and during the reconstruction of Room BK301 common dust will also be generated. During PMF construction limited quantities of waste waters will be generated, mainly during cleaning of the room. These waters will be polluted with suspended matter. These impacts are reviewed in detail below.

Health risk

Non-radiation impacts

No excavation activities are planned because PMF will be built in Room BK301 of AB-2 building. The construction activities will be performed mainly in the room and the site will not be an organized source of harmful physical and/or chemical factors.

The construction activities related to building of the PMF will not have an unfavorable effect on the population. The effect will be limited to an insignificant increase of discomfort from the transport traffic.

Radiation impacts

The health risk for the construction workers by radiological factors could be related to the reconstruction of the air ducts of the existing common exchange ventilation system in Room BK301 situated at the second floor of AB-2. The civil workers could be exposed to radiation dust particles and some radionuclide could penetrate the organism. RAW generated during the reconstruction of the air ducts may increase the external and internal exposure of some other KNPP staff as well.

The analysis of the planned activities during the PMF construction stage shows that radiation impact on the population during the construction is not expected.

Socio-economic impact

Non-radiation impacts

The intention to build the PMF in room BK301 of the existing AB-2 building, which is within the limits of KNPP site, has several advantages from socio-economic point of view that make it a good choice. The main related possible impacts can be:

- There will be no new construction leading to violation of the status of the natural complex components and to change of the land use category. By partial reconstruction and less construction activities the existing AB-2 building (the second floor, in particular) will be adjusted for the PMF needs, which will have a clear economic and social effect;
- New jobs will be created during the construction and higher rate of employment will be achieved for the workers and building specialists in the course of the reconstruction activities. The number of employed people is expected to be around 400;
- New jobs will be created for qualified personnel (23 people) necessary for the PMF assembly activities;
- The construction activities related to the adjustment of the existing room BK301 to the PMF needs could not have any negative impact on the demographic and socio-economic status and behavior of the population living in the area around KNPP in Bulgaria and in the 30 km area in neighboring Romania.

Radiation impacts

The nature of the PMF construction activities does not imply using any radioactive materials. Therefore, there should not be any conditions and possibilities for

radiation impact on the population and the economy. The planned construction activities are not related to radioactive contamination or exposure of the population due to the lack of radioactive sources and materials. Also, the construction will take place in KNPP controlled area.

Furthermore, the strict keeping of the technical requirements and regulations (Laws, Regulations, Rules, Norms, etc.) valid for the KNPP site during the construction activities guarantee the lack of possibilities of radiation impact on the population in the KNPP 30 km area in Bulgaria. The same applies to an even greater extent to the population in the KNPP 30 km area in Romania, meaning that there is no practical possibility of radiation impact on that part of the Romanian population.

Emissions into the air

Non-radiation impacts

Based on the fact that the PMF will be installed on the second floor of an existing building the construction will include mainly altering the height of the building's roof, reconstruction of the room and assembly activities. Due to that no earth moving activities, transportation and soil material disposal are planned during the construction period, and therefore less dust will be emitted in the air. The construction activities include reconstruction of the building and generation of dust emissions is not expected.

The only air contamination during the construction will be the result of the emitted into the air exhaust gases from the internal combustion engines of the machines performing the construction and transport activities. The main pollutants to be emitted are: CO, NOx, SO_2 and dust.

Radiation impact

The analysis of the planned activities during the PMF construction stage shows that radiation impact on the air during the construction is not expected.

Emissions into the water

Non- radiation impacts

During the PMF construction limited quantities of waste waters will be generated, mostly in the cleaning process. These waters will be polluted mainly with suspended substances. The waste waters will not cause any problems for the KNPP sewage system, nor for the purification facilities of the plant.

The impact will take place on and will be limited within KNPP site. The impact is insignificant, but negative and indirect. There will be no secondary or cumulative impacts. The impact will be temporary (only for the construction period) and short-term. The waste waters generated during construction will not disrupt the quality of surface waters in the nearby water basins. They will not impact the ground waters either, because all waste water flows are gathered and led away to be purified to the necessary extent, after which they are discharged in the Danube River. According to permit 13120037/22.11.2010 for discharge of waste waters in the Danube River the generated quantities of cooling and production cooling waters are 73.64 %. This

information leads to the conclusion that the drainage facilities have the necessary capacity to take on the waste waters generated during PMF construction, which are expected to be of insignificant quantity. Their purification will follow the established practices at KNPP for the flows of generated waste waters and the keeping of the emission limits.

Radiation impact

The analysis of the planned activities during the PMF construction stage shows that radiation impact during the construction is not expected.

Waste

Non- radiation impacts

During the construction works some waste is generated during the cleaning and reconstruction of the room where the PMF will be installed. This is solid waste by inert construction materials (bricks, concrete parts, wooden parts, reinforcement bars), metal scrap waste, package waste and municipal waste. The available infrastructure will be used for transportation of the waste if the radioactivity measurement proves that the waste is conventional, it will be treated according to the Law for waste management, aiming at maximum degree of recycling. Service of the construction equipment will be made by external companies outside the site, so no spreading of hazardous waste is expected. Construction and municipal waste will be managed in compliance with the KNPP Conventional Waste Management Program, ID. DOD.UOS.PM 402/02 (2010), approved by Vratza RIEW with Decision130-00/03.01.2011, in force up to 31.12.2013 and the new Law for waste management (SG, 53/2012).

The waste generated at this stage will be treated in an appropriate way, according the adopted procedures, thus adverse impact on the KNPP site is not expected.

Radiation impact

Commissioning of the Plasma Melting Facility is related only to the installation works in the second floor of an existing building on the territory of KNPP, which are not a source of the radiation contamination.

If during the radioactivity control measurement the waste generated during the construction stage is classified as RAW, it should be managed as radioactive waste under the existing procedures for its management at KNPP site.

RAW generated by the activity of Kozloduy NPP will be stored according to the existing procedures. No radiation impact is expected within 30 km area on the neighboring territory of Romania.

Impacts from physical factors

Non-radiation impacts

Negative impact during construction can be caused by the following physical factors:

- **Noise**. The PMF construction will take place in an existing building

and the construction site will not be an organized source of noise. The noise penetrating outside the AB-2 building from the assembly machines and instruments will be much lower than the admissible limits and will not increase the overall noise level at the KNPP site.

- **Vibrations**. Heavy excavation equipment or other facilities which could generate common vibrations and infrasound will not be used on the construction site.
- **Dust**. Common dust will also be generated in the process of reconstruction of room BK301. These dust emissions will be mostly from largely dispersed dust, which will quickly deposit on the floor of the building and around it.
- **Toxic** gases. The toxic gases emissions are expected to be only from:
  - Freight vehicles which will deliver the building materials and equipment.
  - Toxic gases emitted during various types of welding. During open-air welding concentrations of the welding aerosols from 2 to 12 mg/m³ and indoor concentrations of 100 to 150 mg/m³ have been measured.

During the construction activities the following types of **non-ionizing radiation** could be expected: infrared radiation/heat radiation, ultraviolet radiation, light beams, electromagnetic beam. Their intensity will be within the limits of the established norms.

Ionizing radiation impact

The health risk for the construction workers by radiological factors could be related to the reconstruction of the air ducts of the existing common exchange ventilation system in room BK301. The civil workers could be exposed to radiation dust particles and some radionuclide could penetrate the organism. RAW generated during the reconstruction of the air ducts may increase the external and internal exposure of some other KNPP staff as well.

The analysis of the planned activities during the PMF construction stage shows that radiation impact on the population during the construction is not expected.

Impacts on soils and earth bowels

A. Soils

Non-radiation impacts

The PMF construction and installation period does not involve any major construction activities. Earth moving activities will not be performed in this period, which are the common source of impact on soils in the construction phase. The PMF will be serviced by the existing road network and infrastructure and does not require construction of new ones. In the commissioning phase of the PMF no air and water pollutants will be generated, which eliminates the soil contamination.

Non-radiation impact on the soils in the neighboring Romanian territories is not possible.

Radiation impacts

The PMF construction phase consists of assembly of modules in a closed room and is not a source of radiation contamination of the soils. Admittedly, during the PMF connection to the existing AB-2 systems (for example, ventilation and drainage systems), it is possible that an emergency radiation impact on the soils takes place, comparable to the impacts during KNPP operation. In such case, the impact will take place in a closed room and does not represent a threat to the soils. The PMF commissioning does not involve radiation contamination of the soils on KNPP site and around it.

Radiation impact on the soils in Romania is not expected.

B. On the earth bowels

Impact on the earth bowels and the geological foundation cannot be expected due to the PMF construction, because the proposed PMF location is within AB-2.

On the land use

Non-radiation impacts

The IP does not imply construction activities – no new buildings, roads, etc. will be built. The PMF will be installed on the second floor of the existing KNPP building, which will be in the controlled area (CA). The facility will be delivered in modules, which will be assembled on spot. The use of an existing crane is planned in the process of delivery of the facility elements. These facts show that in the period of PMF operation new lands will not be used; appropriation of land or change in the land use is not required.

Radiation impacts

The commissioning of the PMF includes only installation activities in an existing building in KNPP territory, which are not a source of radiation contamination. Therefore, radiation impact on the land use in the construction period is not expected. Radiation impact on the land use in the 30 km area in neighboring Romania is not expected either.

Landscape

Non-radiation impacts

During the PMF construction negative impacts on the landscape elements are not expected. Significant construction activities in the construction period are not expected, because the new facility will be located in an existing building in KNPP territory. The socio-economic function of the landscape will not be changed during construction.

Non-radiation impacts on the landscape structure, the functioning and the cycle of the substances are not expected during construction, because the planned activities will be performed in rooms in the CA. Non-radiation impacts on the landscapes in neighboring Romania are not expected.

Radiation impacts

Radiation impacts on the landscape in the construction phase are not expected, because the planned activities will be performed in rooms in the CA. On the condition that the technical requirements are kept sources of contamination will not exist. This shows that radiation impacts on the landscapes in the 30 km area in neighboring Romania are not expected either.

Flora

Non-radiation impacts

In the PMF construction phase impacts on the flora and vegetation on KNPP site and the nearby territories are not expected, because the IP will be implemented on the second floor of an existing building.

Radiation impacts

The PMF commissioning includes only installation activities in an existing building in KNPP territory, which are not a source of radiation contamination. Therefore, radiation impacts on the flora and vegetation on KNPP site and the nearby territories during construction are not expected. Radiation impacts on the flora and vegetation in the 30 km area in neighboring Romania are not expected either.

Fauna

Non-radiation impacts

The building activities in the PMF construction phase may cause noise pollution and increased anthropogenic presence around the AB-2 building. There is a small possibility of chasing away individuals and damage to the normal population structure. Generally, impact on the fauna on KNPP site and the nearby territories is not expected.

Radiation impacts

The PMF commissioning includes only installation activities in an existing building in KNPP territory, which are not a source of radiation contamination. Therefore, radiation impacts on the fauna on KNPP site and the nearby territories during construction are not expected. Radiation impacts on the fauna in the 30 km area in neighboring Romania are not expected either.

Protected territories and protected areas

Non-radiation impacts

The performance of the main PMF installation activities during construction is not expected to impact the protected territories and protected areas.

Radiation impacts

The PMF commissioning includes only installation activities in an existing building in KNPP territory, which are not a source of radiation contamination. Therefore, radiation impacts on the protected territories and protected areas on KNPP site and

the nearby territories during construction are not expected. Radiation impacts on the protected territories and protected areas in the 30 km area in neighboring Romania are not expected either.

Cultural heritage

Non-radiation impacts

Impact on the cultural heritage including the nearby territories during construction is not expected.

Radiation impacts

The PMF commissioning includes only installation activities in an existing building in KNPP territory, which are not a source of radiation contamination. Therefore, radiation impacts on the cultural heritage on KNPP site and the nearby territories during construction are not expected. Radiation impacts on the cultural heritage in the 30 km area in neighboring Romania are not expected either.

8.3 During PMF operation

An assessment of the direct impacts from the PMF operation is included below.

Health risk

Non-radiation factors

Noise. Organized sources of noise will include the processes related to the RAW acceptance, unloading and feeding to the shredder, the operation of the shredder, as well as the operation of the PTC and STC. Measurement of the equivalent noise level needs to be done after starting of the operation and the necessary technical and medical prophylactic measures must be undertaken.

Vibrations. Common vibrations may be generated by the cranes. The IP does not state such a possibility. It is clear that they will operate from a distance and the generated vibrations will not have a direct impact.

Microclimate. The PTC and STC will be coated from the outside with fire resistance and insulation materials, they will be operated from a distance and the operators will be away from them. Nevertheless, it is necessary to detect the infrared radiation from the facilities. It is one of the main components of the microclimate and has the ability to penetrate deeply in the tissues and to warm them up. Besides the fact that the infrared radiation together with the rest of the microclimate components leads to heat exhaustion and overheating, it may cause heat stroke.The maintenance and repair workers may also be exposed to abnormal levels of infrared radiation.

Toxic gases. Non-radioactive air pollutants are emitted under the same conditions as the radioactive ones. The declared values of dust, CO, SO_2, HF, HCl and TOC concentrations are below the admissible limits and are not expected to have an unfavorable effect.

Work shifts and night operation. Work on shifts and during the night may lead to sleep disorders and disturbances in the diurnal rhythm of many body systems. In

cases of night shifts an increase in the frequency of diseases of the digestive system is observed.

During the PMF operation impacts from conventional factors (noise, vibration, dust, toxic gases) in transboundary aspect on the population of Romania are not expected.

Radiation factors

The IP states that after all the filters – bag filters, HEPA filters, two coarse and two fine filters, the effectiveness of the purification system will be up to 99.99 % retention of the particles smaller than 0.3 μm.

Considering the use of the best available techniques in protection matter and the continuous application of the ALARA principle the dose rate from inhalation and swallowing is very low.

During the PMF operation impacts from radiation factors in transboundary aspect on the population of Romania are not expected.

Socio-economic impact

Non-radiation impacts

The use of part of the released qualified personnel that has participated in the operation of Units 1-4 and the gained experience and knowledge which will be used in RAW treatment and conditioning, as well as the application of the best world technologies to the PMF, will provide social security and confidence not only for the KNPP and PMF personnel, but for the population of the nearby territory. The operation and decommissioning activities will require the creation of new jobs for highly qualified personnel, which will lead to a higher employment rate. Thus a number of socio-economic effects will be achieved – retention of the existing jobs and creation of new jobs for released qualified personnel that has participated in the operation of Units 1-4, use of their rich experience and knowledge, higher professional and social effectiveness in the new PMF activities, ensuring continuity, reduction of unemployment and stable income for the families of the 23 people engaged at the PMF. All that will lead to increased cumulative effect.

Higher employment rate means social security for the personnel, which will increase the effect of the economic productivity:

- The PMF operation, which will ensure a high volume reduction factor for generated RAW and for RAW that will be generated during KNPP operation, will have a positive economic and social effect not only for the plant, but for the population and the environment. The effect will include ensuring bigger capacities of the RAW storage facilities and reduction of the costs for the final deposition of conditioned RAW;
- PMF will operate under normal operational conditions without causing dose rate for the operation and repair personnel, exceeding the admissible levels for KNPP. There will be no negative effect on the social and health status of the rest of the plant`s personnel and the population in the nearby territory.

The above information leads to the conclusion that in socio-economic aspect negative non-radiation impacts on the Romanian population are not expected either.

Radiation impacts

The PMF installation in room BK301 on the second floor of AB-2 is a prerequisite for a smooth operation of the facility in terms of nature preservation.

This argument is also supported by the fact that PMF and AB-2 are located in KNPP CA, which is in reality an "isolated area". The application of the best technologies during PMF operation, as well as the strict keeping of the ALARA principle, is the condition for not allowing any radioactive contamination of the PMF and KNPP sites.

The keeping of these conditions gives no reason to expect radiation impacts on the population and the economy during PMF operation in the KNPP 30 km area both in Bulgarian and Romanian territories in transboundary aspect.

Emissions into the air

Non-radiation impacts

From all operation phases the harmful substances emissions as a result of the plasma and secondary treatment will be most significant. Emissions are also possible during pouring of the mould and cleaning of the facilities. Unorganized emissions will be formed during transportation of waste and the containers with vitrified waste. One organized source of harmful substances emissions will operate during the period of PMF operation. The flue gases will be released through a 150 m ventilation stack.

Non-radiation impacts during PMF operation are not expected including on Romanian territory, because an established technology is used and the requirements of the European documents are kept.

Radiation impacts

The radionuclide in the air are generated mainly in the process of treatment and transfer and are emitted through the System for purification of flue gases. The cleaning gases are led away through VS-2 in AB-2 (stuck height 150 m [9]) together with the gases from KNPP Units 3 and 4 and from the AB-2 ventilation system. The share of the PMF flue gases in the overall release from the tube is 0.17 % [9] and the total released activity is 6.03E+6 Bq/year, corresponding to 1.25 Bq/Nm^3 [8]. Radiation impacts during the PMF operation are not expected including on Romanian territory.

Emissions into the water

Non-radiation impacts

The PMF is planned to use industrial and potable water; the sources are the ones existing at the moment, according to the issued water use permits. The PMF cooling system operates in "closed circles" and the water consumption is limited to the amount of the possible leaks and is expected to be around 2 m^3 per year.

Based on the planned PMF technology, the generated waste waters, which are around 2510 m^3 per year, include the technological water for the scrubber and the cooling water for the facility, which will be treated together with the rest of KNPP industrial waters. These waters are released in the KNPP special sewage system and are purified through evaporation.

It can be concluded that the quantities of sanitary and potable water, waters for industrial use as well as the generated wastewater quantities are within the permitted limits by Danube Region Basin Directorate.

Radiation impacts

The activity of the waste water is expected to be lower than the minimal detectable activity (MDA) – 1 Bq/l. Given the fact that the annual quantity is 400 m^3, the quantity released in the KNPP purification system is 400 Bq/year [9]. Considering the treatment of blow-down water from the scrubber and the water from the cooling module in the KNPP system for purification of waste waters, the activity released in the Danube River is much lower than 400 Bq/year, meaning it is negligible.

Waste

Non-radiation impacts

During the process of operation of the PMF the generation of the following types of non-radiation waste is expected:

Production waste: typical conventional production waste from the technological processes will not be generated and mainly waste from packing will be generated after the use of reagents and auxiliary materials. For the most part, these wastes are suitable for recycling and they should be submitted for further treatment to companies holding permit pursuant to the Waste Management Law (WML).

Hazardous waste: Generation of packaging containing remains of hazardous substances or polluted with hazardous substances is expected. For minimization of the packaging from these chemical reagents the packing should not to be subject of radioactive radiation. Hazardous waste will be temporary stored on the territory of Kozloduy NPP at especially designated places and after accumulation of certain quantities further treatment will be foreseen by specialized companies holding permit pursuant to WML. Luminescent and mercury lamps should be stored in a covered space, fenced, marked and equipped with separate vessels for their temporary storage.

As far as the most part of the waste is suitable for recycling and regeneration, it is foreseen for them to be transferred for following treatment by companies practicing waste utilization.

Domestic waste: Mixed domestic waste, which have not been stored separately, generated by the service staff in the process of operation will be treated together with the total flow of domestic waste from Kozloduy NPP and will be stored at KNPP Repository for conventional municipal and industrial waste (RCMIW).

The waste generated at this stage will be treated in an appropriate way, according the adopted procedures, thus adverse impact on the KNPP site as well as in transboundary aspect is not expected.

Radiation impacts

Generation of radioactive waste

As a result of the PMF commissioning the requirement for application of measures for minimizing of the RAW, subject to disposal, in view of volume and activity by application of suitable technologies for treatment and temporary storage for radioactive decay, will be fulfilled. As a result timely RAW treatment is provided until the waste reaches the form ensuring its safe enclosure and disposal. Waste to be treated in the PMF is:

- abrasive materials and components;
- dust, electrodes, bag filters and other waste (safety gloves, shoes, foil).

Thus the quantity of the radionuclide in this waste is finally immobilized in the slag generated by the plasma treatment.

Transportation of RAW on the territory of Kozloduy NPP is typical for the company activity and is regulated by the existing license for operation of Kozloduy NPP in compliance with the Ordinance for conditions and order for transportation of radioactive materials, Article 2, Paragraph (2) - 2. The waste generated at this stage will be treated in an appropriate way, according the adopted procedures. Thus, adverse impact on the KNPP site as well as in transboundary aspect is not expected.

Impacts from physical factors

Non-radiation impacts

Noise

It is supposed that the main noise source will be the shredder. It is planned to measure the noise level during the operation. In order to observe the normative permissible noise levels additional measures for noise insulation are indicated as well as use of individual noise protection devices to reduce the noise impact in the environment.

Considerable additional impacts by noise load on the site of Kozloduy NPP are not expected since the PMF is installed in an independent building (AB-2).

Magnetic fields

No magnetic fields are expected during the operation of the PMF. Density of the magnetic flow from the Primary Treatment Chamber (PTC) (electrical supply of the plasma torch) is calculated as 8 μT, much below the permissible levels of the respective standards. This complies with the declaration of the Investor that the European Directive for Electromagnetic Compatibility will be observed.

Vibrations

Expected vibrations are typical for the site, negligible in view of the staff on the site of Kozloduy NPP.

Heat emissions

The heat emissions from the cooling system can be approximately calculated based on the need of cooling at 785 kW [9]. Based on the effective operation duration of 4000 h/year, the heat emissions from the cooling system equal approximately 3000°MWh/year, transmitted by water with a flow rate of 458 400 m^3/year. This is negligible in comparison with the heat emissions from KNPP operating units and does not affect the temperature mode of the water discharged in the Danube.

Radiation impacts

The radiation exposure of the operating personnel is described in detail and calculated in the ISAR [8]. Considering the use of the best protection techniques and the continuous application of the ALARA principle the dose rate from inhalation and swallowing is very low.

Forecast data about the radiation dose rate of the staff are much lower than the permissible values the minimal effective dose rate for each of the years should not exceed 20mSv/annually.

Comparing the results with the acceptability criteria the conclusion is that the dose rate of the personnel during the normal operation and during the maintenance of the PMF is below the permissible norms.

For the population an impact by ionizing radiation resulting from PMF is excluded, based on the population dose rate calculations given in Chapter 4 of EIAR. Based on the results presented in Chapter 4 of EIAR it could be concluded that the radiation dose rates in case of accident are much lower than the radiation acceptability criteria.

Soils and earth bowels

A. Soils

Non-radiation impacts

According to the PMF requirements the maximal limits of chemical releases should correspond to the current regulations, including the cases of possible emergencies. The IP analysis shows that PMF operation will comply with all the requirements of the Bulgarian and European legislation. Therefore, the PMF will not cause any impact on the soils during normal operation. Even in cases of possible impact on the soils, it is expected to be within the admissible limits.

During the period of normal PMF operation negative non-radiation impacts on the soils in the KNPP 30 km area including the Romanian territory is not expected.

Radiation impacts

The normal PMF operation is not expected to cause any radiation contamination of the soils at KNPP and around it. The PMF will be connected to the existing ventilation and draining systems of AB-2. Thus, the existing rules and restrictions applied to the CA and KNPP site will be observed. Their values are usually lower than those determined in the Bulgarian legislation.

Small quantities of operational radioactive waste will be generated during the normal PMF operation, including liquid waste, but they will not be released outside of the CA and will not exceed the admissible values. A system for management of liquid RAW will operate as well. RAW transportation within KNPP territory is a common activity for the plant and is regulated in the existing KNPP license for operation. The radionuclide quantities in the water are expected to be below than the MDA – 1°Bq/l.

The emissions of contaminated water in the Danube River will be negligible and contamination of the soils and river bank is not expected.

It can be assumed that the PMF operation has some favorable consequences to the environment – reduction of the RAW volume leading to use of less areas for its storage. During the period of normal PMF operation negative radiation impacts on the soils in the KNPP 30 km area, including the Romanian part is not expected.

B. Earth bowels

Non-radiation impacts

Non-radiation impact on the earth bowels during normal operation is not expected including in transboundary aspect.

Radiation impacts

The normal PMF operation is not expected to cause any radiation contamination of the earth bowels at KNPP and around it.

Landscape

Non-radiation impacts

Non-radiation impact on the landscapes at KNPP and around it during PMF operation is not expected. Non-radiation impact on the landscapes in neighboring Romania is not expected either.

Radiation impacts

Radiation impact on the landscapes during PMF operation is not expected. Radiation impacts on the nature complexes in the KNPP 30 km area and in neighboring Romania are not expected either.

Flora

Negative impact on the flora during PMF normal operation is not expected within the KNPP 30 km area and in neighboring Romania are not expected either.

Fauna

Negative impact on the fauna during PMF normal operation is not expected within the KNPP 30 km area and in neighboring Romania are not expected either.

Protected territories and protected areas

The protected territories on both sides of the Danube River are connected complex ecological systems, which are reviewed in the Compatibility Assessment Report (CAR) with the subject and purposes of the protected areas. As a conclusion from the analyses presented in the CAR it can be stated that the radioecological status is expected to be preserved and there is no possibility for negative impact resulting from the IP implementation on the protected territories and protected areas near to the IP in Bulgaria and in Romania. The following protected areas have been reviewed:

- Protected area "Kozloduy Islands" with code BG0000533 is under the Directive for preservation of the natural habitats and the wild flora and fauna.
- Protected area "Zlatiata", with code BG0002009 under the Directive for preservation of the wild birds.
- Protected area "Ogosta River", with code BG0000614 under the Directive for the habitats.
- Protected area "Skat river" with code BG0000508 under the Directive for the habitats.
- Protected area "Kozloduy" with code BG0000527 is of G type under the Directive for the habitats.
- Protected area "Tsibar" with code BG0000199 is of K type under the Directive for the habitats.

In the specially developed EIA section 11.5 "Impacts in transboundary aspect" the following protected areas in Romania have been reviewed as well:

- Protected area ROSCI0045 is under the e Directive for preservation of the natural habitats and the wild flora and fauna.
- Protected areas ROSPA0010 and ROSPA0023 are under the Directive for preservation of the wild birds.

It can be concluded that during PMF operation in normal technological mode negative impact on the PT and PA in transboundary aspect is not expected. The potential impacts related to emergency situations will be localized and are not expected to reach the territories of the protected areas.

Cultural heritage

When the normal technological regime of the PMF is observed, negative impacts on the cultural heritage in Kozloduy municipality and in the KNPP 30 km area are not expected including on Romanian territory.

Transboundary aspects

The EIA section "Impacts in transboundary aspect" is presented as a separate document with consideration of the Romanian requirements submitted in the consultation process through letters sent by the Romanian ministry of environment and forests to the MEW.

Table 2 presents the results from the dose calculations during PMF operation and with consideration of the cumulative effect from the other sources at KNPP site, based on conservative assumptions.

Table 2 Individual effective dose rates from liquid and gaseous releases from the facilities at KNPP site

Source description	Maximal dose of gaseous aerosol emissions, Sv/a	Maximal dose of liquid emissions, Sv/a	Total maximal dose, Sv/a
Operation of Units 5 and 6	$7.18.10^{-9}$ – $8.02.10^{-7}$	$3.22.10^{-7}$ – $6.00.10^{-7}$	*** $5.03.10^{-6}$
	$8.02.10^{-7}$	*** $4,23.10^{-6}$	
Operation of Units 5 and 6 + Decommissioning of Units 1-4	$7,33.10^{-9}$ - $8,04.10^{-7}$	$3.23.10^{-7}$ – $6.01.10^{-7}$	*** $5.04.10^{-6}$
	$8.04.10^{-7}$	*** $4.24.10^{-6}$	
Operation of Units 5 and 6 + Decommissioning of Units 1-4 + PMF	$7.36.10^{-9}$ – $8.05.10^{-7}$	$3.23.10^{-7}$ – $6.01.10^{-7}$	*** $5.05.10^{-6}$
	$8.05.10^{-7}$	*** $4.24.10^{-6}$	

*** *The dose rate assessments are for a critical group of the population in the 40 km KNPP area.*

The results from the calculations presented in the table show that the effective dose for the population during PMF operation is slightly higher than in case without PMF, but is much lower and negligible compared to the dose rate from the natural radiation gamma background. Therefore, the impact from PMF operation is negligible.

The results from the analysis of the transboundary impact show that the possibility of transboundary impact is minimal and is assessed as negligible.

The assessments have been made based on modeling of the dose rate for the population and are determined by taking into account the expected limit emissions during decommissioning and by considering all of the proposed mitigation measures in Chapter 6 of EIAR. The maximal annual effective dose for a member of the critical group of the population in the KNPP 40 km area as a result from the liquid and gaseous emissions in the environment has been conservatively assessed at 5.05 µSv/a, which is much lower than the 250 µSv/a quota for dose rate from radioactive releases from NPP (Regulation for safety of nuclear power plants) and the limit for the population of 1 mSv/a (BNRP-2012). The results from the calculations presented in the separate document - Section 11.5 from EIA ”Impacts in transboundary aspect” show that the effective dose for the population is very low and insignificant in comparison to the dose rate from the natural gamma background. Comparisons of the collective effective dose rates for the population for KNPP with the parameters for many other NPP with PWR (WWER) reactors show compatibility with the international practice, according to the Report by the UN Science Committee on the investigation of the nuclear radiation impact. (UNSCEAR Report 2000) [17]. It can be concluded that the dose rate in the monitored KNPP 30 km area, and even in the

40 km area (the used model provides information for a larger perimeter as well), including in the Romanian territory, in case of limiting emergencies during the IP implementation, will be many times lower than the required limits of the International document ICPR 103 and the requirements of BNRP 2012.

8.4 During PMF decommissioning

The assessment of the direct impacts can be based on the descriptions and data given in the PMF Decommissioning concept [14], in relation to the quantitative and qualitative assessment of the materials, considering the flow of incoming waste, the decontamination measures during operation and maintenance.

Health risk

Non-radiation impacts

The non-radiation physical factors that the workers engaged in the dismantling will be exposed to, are largely reciprocal to those related to the building and installation of the PMF.

- **Noise.** During the dismantling activities drilling and cutting tools and equipment are used, which according to their type may generate abnormal noise levels. The prophylactic measures already established in practice should be systematically applied.
- **Vibrations.** There will be no sources of common vibrations during the dismantling activities.
- **Work accidents.** The work accidents coefficient in the construction will probably not exceed the average for the country. This requires strict observation of the work safety regulations during decommissioning.

Radiation impacts

The radiation risk will be reduced when the following IP conditions are fulfilled:

- Retention of the radioactivity in the PMF and preventing of contamination outside the building will be enhanced by the performance of operational and dismantling activities at the respective boxes;
- Secondly, the entire algorithm of cleaning and decontamination of the facility should be followed, after which dismantling of the PMF elements should be done;
- The levels of contamination during decommissioning are comparable to the levels of activity of Category 2a waste and with the radionuclide in RAW treated in the PMF.

Working in the area involves radiation risk, which can be reduced and mitigated by application of the necessary measures indicated in Chapters 4 and 6 of EIAR.

Socio-economic impact

Non-radiation impacts

After termination of the PMF production activity in accordance with the developed and approved Concept and Plan for PMF decommissioning dismantling activities will be performed.

In socio-economic aspect the performance of the dismantling activities represents employment of qualified personnel and social security for them and their families. The more important issue, which is not a subject of this elaboration as well as the other KNPP elaborations, will arise after finishing of the dismantling activities and dismissing of the personnel that has participated in the dismantling.

Negative non-radiation impacts on the population in the Bulgarian part of the KNPP 30 km area in socio-economic aspect during PMF decommissioning are not expected.

Negative non-radiation impacts on the population and the economy in the Romanian part of the KNPP 30 km area in socio-economic aspect during PMF decommissioning are not expected either.

Radiation impacts

If the planned measures related to the safety of the personnel and the population and the preventing of contamination of the components of the environment are fulfilled, the activities related to the Plan for PMF decommissioning would not lead to radiation contamination. Therefore, radiation impacts related to the socio-economic status of the population and the economy both in the Bulgarian and Romanian parts of the KNPP 30 km area should not be expected.

Emissions into the air

Non-radiation impacts

During decommissioning the non-radiological pollutants will drop out from the PMF operation, because its operation will be terminated. Unorganized short-term emissions of gases from welding when using thermal cutting methods are expected. These emissions will not influence the air quality in the area, they should be considered only in terms of work hygiene.

Radiation impacts

The AB-2 ventilation system with HEPA filters will operate during decommissioning activities. The expected emissions are negligible. The conclusions have been made based on the radioactivity assessment of the metal surfaces – 64 MBq, and of the refractories – 3 GBq.

Emissions into the water

Non-radiation impacts

The impact on surface and ground water is expected to decrease in the decommissioning process. It will have a fading effect and will ultimately result in the

indicators for the chemical state and the overall ecological state of the water body, in which the KNPP waste water is discharged – the Danube River.

This kind of impact is direct, negative, temporary, short-term and reversible. They will disappear after the completion of decommissioning.

Radiation impacts

Radionuclide

The wet method for decontamination is not planned to be applied. Only small quantities of low activity water may be discharged during cooling of the mechanical cutting activities. Another source is the water from the scrubber which is discharged in the KNPP special sewage system and is purified through evaporation.

Therefore, emissions in the water resulting from decommissioning are not expected.

Waste

Non-radiation impacts

At the decommissioning stage it is expected some construction waste (reinforcement etc.), domestic waste, hazardous waste from spent oils to be generated. It is foreseen to collect the construction waste at specially designated sites for temporary storage on the territory of Kozloduy NPP, after which they have to be transported by a company holding needed permit documents pursuant to the Waste Management Law (promulgated SG issue 53/2012).

Hazardous waste, which will be expected to be generated during the decommissioning stage are from the maintenance and operation of the PMF. It is recommended the oil drainage to be made in preliminary prepared packaging.

Construction waste, which is suitable for recycling, should be submitted to companies holding the needed permit documents for waste activities. If lead waste is produced they could be used on the territory of Kozloduy NPP, if they are not activated.

Domestic waste, which will be generated as a result of the life activity of the staff, with the exception of separately collected waste, will be collected in special containers and will be submitted for disposal in KNPP Repository for conventional municipal and industrial waste (RCMIW).

The waste generated at this stage will be treated in an appropriate way, according to the adopted procedures, thus adverse impact on the KNPP site as well as in transboundary aspect is not expected.

Radiation impacts

Table 3 below presents the quantities and types of materials from the material balance decommissioning. [8]

Table 3 Quantities and types of materials during PMF decommissioning

Type of material	For free release [kg]	RAW [kg]
Metal materials	171097	32115
Concrete	148100	16400
Cables	3164	330
For pressing	1992	
Total	**324353**	**48845**

In addition, secondary waste is generated from the decommissioning activities, such as dust and ashes from the cleaning activities, metal pieces from the cutting activities and technological waste (protective clothing, plastic foil, etc.).

For minimization of the adverse impact it is recommended to develop a "Project for decommissioning and closure of the PMF". A part of this project shall be the procedures for determination of the waste radioactivity in order to execute further treatment. If the waste is not radioactive, it will be managed in compliance with the Waste Management Law and respective by-laws. Contracts should be concluded with companies holding the necessary permits, to which the non-radioactive waste are transferred for further treatment. If the waste is radioactive, instructions should be developed for their further treatment (secondary use, decontamination, and disposal) in compliance with the Ordinance for RAW management.

Impacts from physical factors

Non-radiation impacts

The transport traffic across the settlements will not be increased and the unorganized noise emissions from it will not be increased either. The dismantling site will not be an organized source of noise, because the activities will be performed in the room. The dust impacts from the transport traffic will not be increased.

Radiation impacts

The dose rate during the entire decommissioning process shall be 17 mSv. This is an average value and shows the range of this magnitude.

Soils and earth bowels

A. Soils

Non-radiation impacts

The possible non-radiation impacts are expected to be related to the work hygiene only. Temporary emissions of gases from welding and from transport vehicles may be generated. Impacts on the soils and the lands around the plant, including Romanian territories, are not expected.

Radiation impacts

RAW transportation within KNPP territory is a common activity for the plant and is regulated in the existing KNPP license for operation, according to the Regulation for the order and conditions for transportation of radioactive materials, Article 2, Paragraph (2) - 2. Therefore, contamination from this source is not expected. The emissions of radionuclide in the air and water during decommissioning are expected to be negligible; therefore, contamination of the soils at KNPP site and around it on Bulgarian and Romanian territory is not expected.

B. Earth bowels

Non-radiation impacts

Negative impact on earth bowels by non-radiation factors during decommissioning is not expected if the Program for decommissioning and the radiation protection procedures are strictly followed.

Radiation impacts

Impact on the geological environment and the earth bowels during decommissioning is not expected if the Program for decommissioning and the radiation protection procedures are strictly followed.

Landscape

Non-radiation impacts

Negative impacts on the vertical and horizontal landscape structure during decommissioning are not expected. The entire PMF equipment will be dismantled and removed. These activities will be performed in accordance with previously prepared Concept and Plan for PMF decommissioning. Radiation impacts on the landscape components during PMF decommissioning are not expected. Radiation impacts on the nature complexes in neighboring Romania are not expected either.

Radiation impacts

PMF decommissioning is not related with radiation impacts on the landscape and negative impacts on its structure are not expected. Generated RAW during decommissioning will be classified and sorted according to their physical, chemical and radiation characteristics. RAW management will be performed in accordance with the regulations; therefore, impact on the landscape components is not expected.

Radiation impacts on the landscapes of neighboring Romania are not expected.

Flora

Potential impacts on the flora and vegetation during decommissioning activities related to removal of existing components or systems, decontamination of components, as well as cutting and processing of large parts of equipment, are possible to occur in single risk situations. The end goal of the PMF decommissioning activities is restoration of the area in which the PMF has been located to a state as close as possible to the initial one. At the same time these activities should preserve

human health, the environment and correspond to the regulations. All incoming RAW and the end waste generated at the PMF are classified as Category 2a. Therefore, the contamination levels during decommissioning are comparable to this waste category. Negative impacts on the flora and the vegetation at KNPP site and the nearby territories during treatment of RAW generated during decommissioning of nuclear facilities according to the regulations regarding the RAW management are not expected.

Fauna

Potential impacts on the fauna during decommissioning activities related to removal of existing components or systems, decontamination of components, as well as cutting and processing of large parts of equipment, are possible to occur in the form of chasing away animals due to the increased human presence. The noise pollution and the increased anthropogenic presence during PMF decommissioning may lead to chasing away of individuals and damage to the normal population structure. Based on the facility capacity and the EWN experience, the increased noise and human presence will not have a negative impact on the fauna.

Protected territories and protected areas

Potential indirect impacts on parts of the PT and PA during decommissioning activities related with removal of existing components or systems, decontamination of components, as well as cutting and processing of large parts of equipment, are possible to occur in single risk situations. All incoming RAW and the end waste generated at the PMF are classified as Category 2a. Therefore, the contamination levels during decommissioning are comparable to this waste category.

Negative impacts on the PT and PA in KNPP nearby territories during treatment of RAW generated during decommissioning of nuclear facilities according to the regulations regarding the RAW management are not expected.

Cultural heritage

Potential impacts on the cultural heritage during decommissioning activities related with removal of existing components or systems, decontamination of components, as well as cutting and processing of large parts of equipment, are not possible to occur.

Negative impacts on the cultural heritage in KNPP nearby territories during treatment of RAW generated during decommissioning of nuclear facilities according to the regulations regarding the RAW management are not expected.

9. MEASURES FOR REDUCING, MITIGATING OR PREVENTING OF THE HARMFUL IMPACT FROM THE IMPLEMENTATION OF THE INVESTMENT PROPOSAL

These measures for reducing, mitigating or preventing of the harmful impact from the implementation of the investment proposal are described in detail in EIAR Chapters 4 and 6. In chapter 6 these measures are divided in two groups: measures proposed by the Designer and measures proposed by the EIA experts.

Measures for mitigation and minimization of the adverse impact on the environment indicated by the Designer

The radiation exposure of the personnel will be minimized by effective application of the principles (ALARA principle – as low as reasonably achievable) and programs required under the radiation protection standards.

Table 4 Plan for implementation of the measures indicated by the Designer

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
1.	Implementation of the first barrier in the PMF to prevent the release of radioactive contamination into the room air, where the new treatment facility will be located, is the installation itself (feeder, plasma furnace, secondary combustion chamber and flue gas system). The physical boundary of the process flow will be confined within different enclosures, mechanical equipment, confinements and vessels.	Design Commissioning Operation	Occupational health and safety Protection of the occupational and public health Environmental protection	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	IBERDROLA for the design stage KNPP for the commissioning and operation stages
2.	Implementation of the second barrier consisting in the equipment that houses radioactive waste is under a controlled under-pressure by means of the extraction fans. Under-pressure conditions will be imposed	Design Commissioning Operation	Occupational health and safety Environmental protection	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**,	IBERDROLA for the design stage KNPP for the commissioning and operation stages

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
	in all operating conditions. Furthermore, all the existing gases will be routed to the KNPP ventilation stack 2 (VS-2) of AB-2 after passing through different filtering and cleaning stages (existing and new).			(2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	
3.	Implementation of the third barrier to an unlikely hypothetical radioactive release of the PMF - the building itself where sub-atmospheric conditions are required during operating conditions. Even though the building is not a leak tight confinement building, the existing ventilation system guarantees sub-atmospheric conditions from the external area and the suctioning of possible indoor contamination through HEPA filters before being released through the ventilation stack- 2 to the environment.	Design Commissioning Operation	Occupational health and safety by minimization of the residual contamination in the internals of the equipment, reducing the risk of spread of contamination and the operator dose. Protection of the occupational and public health Environmental protection	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	IBERDROLA for the design stage KNPP for the commissioning and operation stages

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
4.	Establishing of Instruction for periodical cleaning where maintenance activities are carried out, preventing the accumulation of contamination along all the operation stage.	Design Commissioning Operation	Occupational health and safety Protection of the occupational and public health Environmental protection	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	IBERDROLA for the design stage KNPP for the commissioning and operation stages
5.	The periodical cleaning of the respective components inside the PMF to be carried out by special adapted vacuum cleaner aiming to minimize the spread of contamination. It will be used to clean the refractory concrete of the PTC when repaired, the insides of the STC, the boiler, the bag house, the HEPA-filters, confinement of ash collection chamber, etc. and also the surroundings during and after	Design Commissioning Operation	Occupational health and safety Protection of the occupational health	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,**	IBERDROLA for the design stage KNPP for the commissioning and operation stages

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
	maintenance activities.			(5) **the health of the personnel and the population**	
6.	Before a planned shutdown of the PMF, the last waste batch fed to the system should be with very low activity. By this procedure the residual radiation into the different components is reduced and in fact is "flushed out" and decontaminated.	Design Operation	Occupational health and safety by minimizing the residual contamination in the internals of the equipment, reducing the risk of spread of contamination and the personnel doses.	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	IBERDROLA for the design stage KNPP for the commissioning and operation stages
7.	In any case, for locks or covers, which have to be opened for maintenance or inspection and are considered critical in terms of potential spread of contamination, temporary confinements consisting of aluminum frames and plastic foils to be installed (e.g. on top of PTC for refractory replacement).	Construction Operation	Occupational health and safety by minimization of the residual contamination in the internals of the equipment, reducing the risk of spread of contamination and the operator dose.	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and**	IBERDROLA the construction stage through own supervision KNPP for the operation stage

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
				belonging territories, (4) **preservation of the environment,** (5) **the health of the personnel and the population**	
8.	Maintenance or inspection at confinements is normally executed with extra protective clothing and wearing of masks in order to protect operators or maintenance people from contamination. The suspected contaminated plastic foils from maintenance activities can be treated in the PMF.	Operation	Occupational health and safety by minimization of the residual contamination in the internals of the equipment, reducing the risk of spread of contamination and the operator dose.	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	KNPP
9.	The operators and the radiation protection agent shall perform regular inspections of the contamination around the plant equipment to detect occurring contamination at an early stage.	Operation	Occupational health and safety by minimization of the residual contamination in the internals of the equipment, reducing the risk of spread of	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**,	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
	Thorough cleaning prevents the spread of contamination due to immediate decontamination work.		contamination and the operator dose.	(2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	
10.	Efficient performance of the programs required by the standards in force in relation to Radiation Protection.	Design, Operation Decommissioning	Protection of the human health and of the environment	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	IIBERDROLA for the design stage KNPP for the commissioning and decommissioning stages
11.	Maintaining and updating of the above mentioned documents, which are directly related to the provision	Design, Operation Decommissioning	Protection of the human health and of the environment	Reduction, prevention or avoidance of the adverse effects related to	IBERDROLA for the design stage

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
	of radiation protection at the respective facility.			(1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	KNPP for the commissioning and decommissioning stages
12.	The off gas treatment system to achieve emission values under the below listed thresholds: Total dust – 1°mg/m^3; CO-5°mg/m^3; TOC-1°mg/m^3; HCl – 1°mg/m^3; HF-1°mg/m^3; SO_2-5°mg/m^3; NOx – 100°mg/m^3; Heavy metals: Sum of Cd and Tl – 0.005°mg/m^3; Hg - 0.005°mg/m^3; Sum of Sb, As, Pb, Cr, Cu, Mn, Ni, V, Sn- 0.05°mg/m^3; Dioxins and Furans - 0.01°ng/Nm^3.	Design, Operation	Protection of the atmospheric air, the soils, the vegetation and the human health against pollution	By radioactive and non-radioactive releases in the atmosphere regarding the population	The Designer for the design stage KNPP for the operation stage
13.	Introduction of Continuous Emissions Monitoring (CEM) of the off-gas emissions.	Design, Operation	Protection of the atmospheric air, the soils, the vegetation and the human health against	By radioactive and non-radioactive releases in the atmosphere	IBERDROLA for the design stage KNPP for the

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
			pollution		operation stage
14.	The wastewater discharge system of the facility to be insulated in order to prevent potential interaction with the groundwater.	Design, Operation	Protection of the surface and ground waters against contamination	By radioactive and non-radioactive releases in the surface and ground waters	IBERDROLA for the design stage KNPP for the operation stage
15.	Observance of the best practices in the technological process and maintenance in normal operational conditions of the PMF.	Design, Operation	Protection of the human health and of the environment	For the biological diversity, flora, fauna, protected territories and protected areas under (Natura 2000), landscape, human health and cultural heritage	IBERDROLA for the design stage KNPP for the operation stage

Measures for mitigation and minimization of the adverse impact on the environment indicated by the EIA experts – authors of the EIAR

The measures given in table 5 are also presented in EIAR Chapter 4 and 6 and encompass all phases of the Investment Proposal implementation, and are compliant with the provisions of Appendix 2a to art.14 (1), item 5 of the Regulation on the terms and procedures for performing EIA, the Regulation on radiation protection during activities with sources of ionizing radiation (SIR). The measures are in compliance with the EBRD requirements [4] and are included in the Plan for environment and social aspect presented in chapter 11, section 11.6.

Table 5 Plan for implementation of the measures indicated by the EIA experts - authors of the EIA-R

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
1.	Establishment, maintenance and regular update of Instructions for radiation protection of the facility; Internal emergency plan for the facility, including measures for fire, explosion and accident protection.	Design Operation Decommissioning	Provision of radiation protection for the respective facility. Protection of the human health and the environmental components.	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
2.	Establishment, maintenance and regular update of Internal regulations and/or procedures for receiving, storage, return and accounting of sources of ionizing radiation at the facility.	Design Operation Decommissioning	Provision of radiation protection for the respective facility. Protection of the human health and the environmental components.	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	KNPP
3.	Establishment, maintenance and regular update of Internal rules and procedures for collection, sorting, processing, handing over, storage and accounting of the generated radioactive waste at the facility.	Design Operation Decommissioning and closure	Occupational health and safety	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
				environment, (5) **the health of the personnel and the population**	
4.	Establishment, maintenance and regular update of Internal regulations and/or procedures for using individual means of radiation protection of the personnel and for maintaining of personal hygiene from the point of view of radiation safety.	Design Operation Decommissioning and closure	Occupational health and safety	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	KNPP
5.	Establishment, maintenance and regular update of Internal regulations and/or procedures for radiation control at the facility and for individual occupational dose control of the personnel and program for	Design Operation Decommissioning and closure	Protection of the human health and the environmental components	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
	radiation control in the radiation protected area and the monitored area around the facility.			(3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	
6.	Establishment, maintenance and regular update of Orders, appointing the persons responsible for the radiation protection at the facility; the persons responsible for receiving, handling, storing, accounting and controlling the sources of ionizing radiation at the facility; the persons responsible for notification in case of incidents and accidents with sources of ionizing radiation; the executives and the radiation protection operators at the facility, as well as the persons, authorized to work	Operation Decommissioning and closure	Protection of the human health and the environmental components	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
	with sources of ionizing radiation at the facility.				
7.	Establishment, maintenance and regular update of Internal regulations and procedures for the terms and procedures for giving the right for individual work with sources of ionizing radiation, holding of initial, routine current and periodical training and checks of the knowledge and skills of the personnel.	Operation Decommissioning and closure	Protection of the human health and the environmental components.	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	KNPP
8.	Establishment, maintenance and regular update of Job descriptions of the personnel in their sections, related to activities with sources of ionizing radiation.	Operation Decommissioning and closure	Protection of the human health and the environmental components.	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
				contamination of soils and belonging territories, (4) **preservation of the environment,** (5) **the health of the personnel and the population**	
9.	Establishment, maintenance and regular update of Rules for authorization and provision of radiation protection of outside teams summoned for the liquidation and limitation of the consequences of an accident that has occurred at the facility.	Operation Decommissioning and closure	Protection of the human health and the environmental components.	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	KNPP
10.	Classification of the work places and of the radiological areas in the PMF, strict control on the	Operation Decommissioning and closure	Minimization of the occupational health risk	Reduction, prevention or avoidance of the adverse effects related to	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
	personnel access in there.			(1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	
11.	Performance of regular dosimetric controls of the PMF operational staff and of the maintenance staff in compliance with Regulation 32/7.11.2005.	Operation Decommissioning and closure	Minimization of the occupational health risk	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
12.	Performance of regular radiation control of the ambient air in the PMF premises and facilities.	Operation Decommissioning and closure	Minimization of the occupational health risk	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	KNPP
13.	To wear protective cloths and gloves in the PMF controlled areas.	Operation Decommissioning and closure	Minimization of the occupational health risk	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
				environment, (5) **the health of the personnel and the population**	
14.	When work is performed in areas with probability of radioactive contamination of the air or not captured surface contamination, the use of protective means for the respiratory system is imperative.	Operation Decommissioning and closure	Minimization of the occupational health risk	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	KNPP
15.	During the outages for cleaning, prophylactics, calibration, decontamination or repair of the PMF – to wear protective cloths and breathing masks.	Operation Decommissioning and closure	Minimization of the occupational health risk	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
				(3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	
16.	Monitoring of the occupational health of the operation and maintenance staff in accordance with the national statutory requirements and KNPP rules.	Operation Decommissioning and closure	Minimization of the occupational health risk	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	KNPP
17.	Execution of all medical prophylactic measures, applied by KNPP for the	Operation Decommissioning and closure	Minimization of the occupational health risk	Reduction, prevention or avoidance of the adverse effects related to	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
	staff working in area class A.			(1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	
18.	Optimization of the facility operation and special attention to $DeNO_X$ system operation, respectively observation of the NOx releases.	Operation	Limiting of the NOx average daily emissions to a value of less than 100°mg/m^3	By radioactive and non-radioactive releases **in the atmosphere regarding the population.**	KNPP
19.	At the outlet of the off-gas cleaning system Continuous Emissions Monitoring (CEM) equipment will be installed to verify that all exit gases are within the proper ranges. That means off-gas effluents will be measured before the	Design Construction Operation	Minimization of the occupational health risk	By radioactive and non-radioactive releases **in the atmosphere regarding the population.**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
	exhaust point to assure that the limits and recommendation of the EC document are fulfilled.				
20.	Continuing the Continuous Emissions Monitoring (CEM) of the active releases through the stack of AB-2.	Operation	Minimization of the public health risk	By radioactive and non-radioactive releases **in the atmosphere regarding the population.**	KNPP
21.	Update of the Emergency Preparedness Plan with the incorporation of the PMF facility.	Operation Decommissioning and closure	Minimization of the public health risk	For **the biological diversity**, flora, fauna, protected territories and protected areas under (Natura 2000), landscape, human health and cultural heritage	KNPP
22.	Prevention activities related to the public disclosure for the occurrence of incidents and accidents.	Operation Decommissioning and closure	Minimization of the public health risk	For **the biological diversity**, flora, fauna, protected territories and protected areas under (Natura 2000), landscape, human health and cultural heritage	KNPP
23.	Maintaining and continuous updating of all operational documentation – instructions, ordinances, reports etc.	Operation	Optimal operation process to avoid incidents or irregular operation status and releases of emissions in the atmosphere.	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
				(3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	
24.	Maintenance of the components of the off-gas cleaning system in good condition for reaching the best effect of its functioning.	Design Construction Operation Decommissioning and closure	Minimization of the public health risk Environmental protection.	Non-radioactive releases **in the atmosphere regarding the population.**	KNPP
25.	To ensure that during normal operation, expected operational conditions and design basis accidents in the facility the dose limits determined in art. 9, items1 and 2, as well as item 3 – for the period after closure of the facility, according to the Regulation for safety during RAW management, will not be exceeded. For that purpose censors should be mounted to	Design Operation Decommissioning and closure	Minimization of the health risk. Environmental protection.	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
	ensure "online" control of the radiation gamma background.			**personnel and the population**	
26.	Development and execution of a Program for in-house radiological monitoring, which should be part of the overall Program for radiological monitoring of the plant site.	Design Construction Operation Decommissioning and closure	Minimization of the health risk. Environmental protection.	Reduction, prevention or avoidance of the adverse effects related to (1) **radiation exposure of the personnel**, (2) **RAW management,** (3) **radioactive contamination of soils and belonging territories,** (4) **preservation of the environment,** (5) **the health of the personnel and the population**	KNPP
27.	The dismantling activities to be carried out under strict preliminary control on the already realized dose exposure and under periodic control during the dismantling activities.	Decommissioning and closure.	Minimization of the occupational health risk	Reduction, prevention or avoidance of the adverse effects related to the **health of the personnel and the population.**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
28.	The primary released waste water shall be collected and necessary parameters will be measured. The waste water shall be released into existing KNPP liquid collection system in a controlled manner and in accordance with the licensing conditions.	Design Construction Operation	Surface and ground water protection against contamination	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP
29.	All chamber interfaces to be flanged sealing surfaces to prevent leaks in or out of the furnace. The system to operate under negative pressure to prevent leakage into the chamber.	Design Construction Operation	Surface and ground water protection against contamination	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP
30.	In order to prevent the spillage of hazardous liquids spillway trays (containments) to be placed below the tanks. In case of spillage the liquid to be maintained in the spillway tray until the disposal by the proper means.	Design Construction Operation	Surface and ground water protection against contamination Minimizations of the consequences in case of accidents	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
31.	Prohibition of use of materials containing priority substances in the construction of structures, engineering facilities and others, leading to actual or possible contact with the groundwater.	Design Construction	Drinking water protection.	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP
32.	Reconstruction or construction of a drainage system. All the drain waters will be collected in a vessel to be processed properly afterwards in dependence of their radioactivity.	Design Construction Operation	Surface and ground water protection against contamination Minimization of the consequences in case of accidents.	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP
33.	Introduction of special operation instructions aiming at the strict observation of the PMF process mode.	Operation	Continuous control on the entire facility functioning to prevent leaks.	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP
34.	Regular control and appropriate maintenance of the active drainage pipeline in order to prevent potential leakages and radioactive contamination.	Operation	Surface and ground water protection against radioactive contamination	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
35.	Control over compliance with the conditions of permits for water use.	Construction Operation	Drinking water protection. Control of water use.	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP
36.	Control over compliance with the conditions of permits for discharges of generated wastewater.	Construction Operation	Surface and ground water protection against contamination	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP
37.	Control over compliance with prohibitions against direct discharge of water containing hazardous and noxious substances in the protection zones of groundwater.	Construction Operation	Drinking water protection.	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP
38.	Optimizing water use for industrial purposes by introducing rotations.	Construction Operation	Protection of water resources	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP
39.	Control on prohibitions on the disposal of priority substances that can lead to their indirect discharge into groundwater.	Construction Operation	Ground water protection against contamination	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP
40.	Control of industrial areas for industrial and hazardous waste.	Construction Operation	Surface and ground water protection against contamination	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP
41.	Compliance with the regulation for assessing the environmental impact during	Construction Operation	Protection of drinking water.	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
	construction and technologies which are likely to affect the quantity and/or quality of drinking water.				
42.	Monitoring of wastewater containing harmful and hazardous substances.	Construction Operation	Protection of waters against pollution by priority substances.	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP
43.	Monitoring of water and water bodies affected by the discharge of wastewater containing harmful and hazardous substances.	Construction Operation	Protection of waters against pollution by priority substances.	By radioactive and non-radioactive releases **in the surface and ground water.**	KNPP
44.	Control of air pollution on water status.	Construction Operation	Protection of waters against pollution.	By radioactive and non-radioactive releases **in the atmosphere and surface and ground water.**	KNPP
45.	Establishment of soils monitoring plan – 6 and 12 months upon commissioning of the PMF. Determination of the radionuclide content in the layer 0-2 cm, 2-5 cm and 5-10 cm.	Design Operation	Soils and biodiversity protection	For the biological diversity, flora, fauna, protected territories and protected areas under (Natura 2000), landscape, human health and cultural heritage	KNPP
46.	Regular monitoring in accordance with KNPP plan for soil monitoring in the 36	Operation	Soils and biodiversity protection	For the biological diversity, flora, fauna, protected territories and protected areas	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
	monitoring stations.			under (Natura 2000), landscape, human health and cultural heritage	
47.	Observance of the best practices in decommissioning of such facilities.	Decommissioning	Biodiversity conservation	For the biological diversity, flora, fauna, protected territories and protected areas under (Natura 2000), landscape, human health and cultural heritage	KNPP
48.	Continuation with the established at KNPP practice for management of the hazardous chemical substances with incorporation of the substances necessary for the PMF operation.	Construction Operation	Environmentally friendly waste management and minimization of the health risk	For the biological diversity, flora, fauna, protected territories and protected areas under (Natura 2000), landscape, human health and cultural heritage	KNPP
49.	Construction waste will be managed in accordance with the Regulation on management of construction waste and use of recycled building materials (SG 89/13.11.2012)	Construction Operation	Environmentally friendly waste management	For the biological diversity, flora, fauna, protected territories and protected areas under (Natura 2000), landscape, human health and cultural heritage	KNPP
50.	Introduction of the WMA requirements for separate collection of packaging waste	Construction Operation	Environmentally friendly waste management	For the biological diversity, flora, fauna, protected territories and protected areas under (Natura 2000), landscape,	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
	according to art. 33, par. 4 from WMA			human health and cultural heritage	
51.	Handing over the waste from ferrous and nonferrous metals to companies holding the license under art. 67 of the WMA on contractual basis.	Construction Operation	Environmentally friendly waste management	For the biological diversity, flora, fauna, protected territories and protected areas under (Natura 2000), landscape, human health and cultural heritage	KNPP
52.	Updating the record books for the waste in accordance with Ordinance № 2/2013 on the procedures and forms for providing information on waste management activities and procedures for the conduct of public records (SG 10/05.02.2013)	Construction Operation Decommissioning	Environmentally friendly waste management	For the biological diversity, flora, fauna, protected territories and protected areas under (Natura 2000), landscape, human health and cultural heritage	KNPP
53.	In case of shortage of capacity of existing warehouses for temporary storage of waste to build a site for temporary storage of waste prior to their submission for utilization, including recycling.	Construction Operation Decommissioning	Environmentally friendly waste management	For the biological diversity, flora, fauna, protected territories and protected areas under (Natura 2000), landscape, human health and cultural heritage	KNPP

No	Description of the measure	Period/Phase	Result	Impact/Issue	Responsible party
54.	Elaboration of RAW management procedures in dependence of the type, mode of generation and further treatment.	Operation Decommissioning and closure	Environmentally friendly waste management and minimization of the health risk	For the biological diversity, flora, fauna, protected territories and protected areas under (Natura 2000), landscape, human health and cultural heritage	KNPP
55.	Implementation of the accounting documents and waste flow tracking data base (part of DEMANS) on the incoming quantities, quantities of temporary stored and treated wastes on the PMF territory as well as the wastes handed over for further treatment.	Operation Decommissioning and closure	Environmentally friendly waste management and minimization of the health risk	For the biological diversity, flora, fauna, protected territories and protected areas under (Natura 2000), landscape, human health and cultural heritage	KNPP
56.	Elaboration of a Design project for PMF decommissioning. Part of this project shall be the procedures for waste activity inventory in view of further treatment.	Decommissioning	Environmentally friendly waste management and minimization of the health risk	For the biological diversity, flora, fauna, protected territories and protected areas under (Natura 2000), landscape, human health and cultural heritage	KNPP

Recommendations to the Environmental Management

To guarantee the application of a systematic approach to managing the environmental and social issues and impacts associated with Employer's activity, different plans and programs are established including an **Environmental Management Plan (EMP)** (chapter 11 Appendix 16 of EIA-R). Effective management systems, appropriate to the size and nature of the business activity of KNPP, allow the company to better manage risks, take advantage of opportunities, enhance their social and environmental performance and reputation and often lead to improved financial performance. This plan shall outline the responsibilities of KNPP within the process of appraisal activities such as risk assessment, auditing, or management of the environmental and social problems arising from project implementation. The project stakeholders' engagement shall be inseparable part of this process. The plan shall include at minimum the following goals:

- To identify and assess environmental and social impacts and issues, both adverse and beneficial, associated with the project;
- To adopt measures to avoid, or where avoidance is not possible, minimize, mitigate, or offset/compensate for adverse impacts on workers, affected communities, and the environment ort;
- To identify and, where feasible, adopt opportunities to improve environmental and social performance;
- To promote improved environmental and social performance through a dynamic process of performance monitoring and evaluation;
- To identify people or communities that are or could be affected by the project, as well as other interested parties;
- To ensure that such stakeholders are appropriately engaged on environmental and social issues that could potentially affect them through a process of information disclosure and meaningful consultation;
- To maintain a constructive relationship with stakeholders on an ongoing basis through meaningful engagement during project implementation.

Environmental and social issues and impacts will also be analyzed for the relevant stages of the project cycle. These may include preconstruction, construction, operations, and decommissioning or closure and reinstatement. The assessment will also consider potential transboundary and global issues, such as impacts from discharges and emissions, increased use or contamination of international waterways, greenhouse gas emissions, climate change mitigation and adaptation issues, and impacts on endangered species and habitats.

Recommendation to the PMF site monitoring plan

To be able to check that the residual impacts identified are the only ones which might occur it is proposed to implement a standalone **site monitoring plan (SMP)** as evaluation measure as inseparable part of the KNPP Monitoring Plan. This would ensure that no unexpected impacts arise and that the proposed mitigation measures are working adequately. If unexpected impacts do arise, this would give an

opportunity to take remedial action. In order to control the effectiveness of mitigation measures in avoiding or reducing impacts, it will be necessary to define the measuring points and the frequency and methodology used for such measurements; and also the values that are to be expected, in order to be able to detect differences between the actual situation and that predicted.

In order to achieve the ecological goals for achieving, maintaining and improving the good condition of waters in the Danube basin water management by 2015, the Plan for environmental monitoring should include measures for protection of the drinking water under Program 7.1.3 with code BG1MB022, BG1MB011 and BG1MB018; measures to regulate water abstraction of fresh surface water and groundwater under Program 7.1.4 with code BG1MB039 and BG1MS014; measures to regulate emissions by introducing prohibitions on the introduction of pollutants from point sources under Program 7.1.5.1 and 7.1.5.2 with code BG1MS016, BG1MS017 and BG1MB076; measures to regulate emissions by introducing prohibitions on the introduction of pollutants from diffuse sources of pollution under Program 7.1.6 with code BG1MB098, BG1MB082, BG1MB108, BG1MB109 and BG1MB085; measures for water pollution from priority substances under Program 7.1.7 with code BG1MB055 and BG1MB056. These measures are indicated in EIAR chapter 6 as recommended by Danube basin water management.

Recommendation to the PMF emergency plan

KNPP Plc has its own Emergency Plan. In connection with the implementation of this IP the Plan shall be updated integrating also the emergency action in case of accidents or incidents on PMF. The Emergency Plan provides information on emergency preparedness, demonstrating in a reasonable manner that, in the event of an accident, all actions necessary for the protection of the public, workers and the environment will be taken. Emergency planning arrangements, commensurate with the hazards, shall be established and maintained according to KNPP Emergency Plan. Incidents significant to safety shall be reported to the client in a timely manner.

To include the measures to prevent or reduce the impact on surface and groundwater emergency pollution under Program 7.1.8 from the Management plan for the river basins, section 7 with code BG1MB0114, BG1MB117 and BG1MB118. To develop a regulation to be able to act in case of major accidents. Immediately to notify the appropriate authorities in emergency situations which create opportunities for contamination of the water body, and to provide for measures to reduce and/or eliminate the consequences of the pollution. These measures are indicated in EIAR chapter 6 as recommended by Danube Region Basin Directorate.

10. SUMMARIZING CONCLUSION

Based on the expert conclusions it can be summarized that the impacts from the Investment Proposal implementation on the environment and the human health are very low, considering the following:

- The radiological impacts are reduced too much lower levels by consistent application of the ALARA (As low as reasonably achievable) principle, which has been successfully applied to all previous activities at KNPP site. Transboundary radiological impacts are not expected.
- The non-radiological impacts from the PMF construction, operation and decommissioning activities, such as the generation of non-radioactive waste and emissions of harmful substances in the atmosphere as a result of transport activities, are assessed as very low and of local importance, as well as limited in time. Transboundary non-radiological impacts are not expected.

Most of the impacts are expected to be very low but could be further reduced by application of the proposed measures for minimization, mitigation and avoidance of the harmful impacts.

Based on the analysis and the assessment of the investment proposal “Installation and operation of a Facility for treatment and conditioning of radioactive waste with high volume reduction factor at KNPP”, the performed investigations, studies and consultations, as well as the estimated impact by the project on the components of the environment and the influencing factors, the authors of the present EIA Report recommend to the Supreme Council of Environmental Experts at MEW to prescribe the application of the measures and recommendations, made in this Report and to APPROVE the implementation of the KNPP investment proposal.

11. REFERENCE

1. Environmental Protection Act (EPA), SG 91/25.09.2002, amended SG 253/13.07.2012, amended SG 82/26.10.2012, amend. SG 15/15.02.2013, last amend.27/15.03.2013.
2. Regulation on the terms and procedure for implementing Environmental impact assessment (Title amended – SG 3/2006), adopted with CMD 59/7.03.2003, prom. SG 25/18.03.2003, amended SG 3/10.01.2006, SG 80/9.10.2009, SG 29/16.04.2010, SG 3/11.01.2011, SG 94/30.11.2012, in effect since 30.11.2012
3. EBRD environment procedures, 28.07.2003.
4. EBRD environment and social policy, 2008.
5. EC Directive 2000/76/EO 3.
6. BREF, Waste incineration, European commission, 2006
7. Regulation 6/28.07.2004 on the conditions and requirements for the construction and operation of incineration facilities and facilities for joint incineration of waste, SG 78/7.09.2004, amended SG 98/5.11.2004
8. PMF Intermediate safety analysis report, I-650-RP-0012(B) Rev. 2, 2011
9. Technical design for construction of a PMF facility, 2011
10. Technical specification for delivery and construction of a PMF facility, 2011.
11. PMF EIA Input Report, I-650-RP-0009 (E) Rev. 2, 2011.
12. Regulation 32 on the terms and conditions for performing of individual dosimetric control of the persons working with sources of ionizing radiation, SG 91/15.11.2005.
13. Terms of Reference for the scope of the environmental impact assessment for the Facility for treatment and conditioning of radioactive waste with a high volume reduction factor at Kozloduy NPP, KPMU/IAE/012/ rev.7, 31.10.2012
14. Concept for decommissioning of PMF, I-650-PL-0222 (E) Rev. 0, 2011.
15. Law on safe use of nuclear energy, last amended SG 38 /18.05.2012.
16. Regulation on safety during RAW management, 2004.
17. United Nations Scientific Committee on the Effects of Atomic Radiation UNSCEAR 2000 Report to the General Assembly, with scientific annexes.

12. GLOSSARY

"Accident" means sudden technological failure of machines, facilities and units involving stopping or serious disturbance of the technological process, explosions, occurrence of fire, excessive environmental pollution, destruction, casualties or hazard to human life and public health.

"Closure" means the completion of all operations following the emplacement of spent fuel or radioactive waste in a disposal facility. This includes the final engineering or other work required to bring the facility to a condition that will be safe in the long term.

"Construction and demolition waste" shall be waste resulting from construction activity on construction sites, as well as waste from the demolition or remodeling of buildings and facilities.

"Controlled (access) area" means an area designated for the purposes of physical protection, enclosing an area around the protected area of a nuclear facility or another facility with sources of ionizing radiation, to which access is controlled.

"Decommissioning" means all administrative and technical actions taken to allow the release of a nuclear facility from regulatory control under the Act on the Safe Use of Nuclear Energy (ASUNE), including closure of a radioactive waste disposal facility or of a spent nuclear fuel storage facility. These actions include the processes of decontamination and dismantling.

"Disposal" (*in repository*) means emplacement of spent fuel or radioactive waste in an appropriate facility or a given location without the intention of retrieval at any time in the future.

"Emergency preparedness" means the capability to take immediate actions that will effectively mitigate the impact of a possible accident on human health, the environment and property.

"Emission" means the direct or indirect release of substances, vibrations, heat or noise by point or fugitive sources within a specific installation into the air, water or soil.

"Environmental monitoring" means the collection, evaluation and summarizing of environmental information by means of continuous or periodic observation of certain qualitative and quantitative indicators characterizing the state of the environmental media and the changes therein resulting from the impact of natural and anthropogenic factors.

"Event" means any deviation from the standard mode of operation, including one or more equipment failures, operating error or errors and/or deficiency of instructions and procedures, which has led or could have led to release of radioactive substances into the working or surrounding environment or to unwarranted public or occupational exposure, or to breach of nuclear safety or radiation protection requirements, rules and standards.

"Exposure" means the impact of ionizing radiation in the course of passing through an exposed medium.

"Grave natural disaster of an exceptional character" (Force Majeure) means a catastrophic, unforeseeable and unavoidable natural disaster.

"Hazardous waste" shall be waste whereof the composition, amount and properties present risks to human health and the environment, which possesses one or more properties which define it as hazardous, and/or which contains components which render it into hazardous waste and/or which is designated as such according to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.

"Impact" means any effect on the environment that may be caused by the implementation of an investment proposal for construction, activity or technology, including the effect on human health and safety, flora, fauna, soil, air, water, climate, landscape, historical monuments and other material assets or the interaction among these factors.

"Incident" means a technical event or anomaly which, although not directly or immediately affecting nuclear safety and/or radiation protection, is liable to lead to a subsequent re-evaluation of the provisions for nuclear safety and/or radiation protection.

"Industrial waste" means waste resulting from the industrial activities of natural and juristic persons.

"Ionizing radiation" means the transfer of energy in the form of particles or electromagnetic waves of a wavelength of 100nm or less or a frequency of $3x10^{15}$ Hz or more capable of producing ions directly or indirectly.

"Municipal waste" means waste resulting from the life activities of people at home and at office, social and public buildings. Waste from distributive-trade establishments and accessory handicraft activities, recreational and entertainment establishments shall be subsumed under household waste where not having the nature of hazardous waste and where, concurrently, the amount or composition thereof will not impede their treatment together with municipal waste.

"Nuclear facility" means a facility and its associated land, buildings and equipment in which nuclear material is produced, processed, used, handled, stored or disposed of on such a scale that consideration of nuclear safety and radiation protection is required. Any radioactive waste management facility shall likewise qualify as "nuclear facility". *

"Nuclear installation", "nuclear accident", "nuclear material", "person" and "operating" are the terms defined in article I from the Vienna convention.

"Nuclear power plant" means a power plant for power generation from one or more nuclear power units, including all auxiliary facilities for RAW and spent nuclear fuel management, localized at one site with common physical protection and accident planning.

"Nuclear reactor" means any nuclear installation containing nuclear fuel in such an arrangement that a nuclear fission chain reaction can occur in the installation without an additional source of neutrons.

"Nuclear safety" means the state and the capability of a nuclear facility and of its systems and personnel to achieve appropriate operation conditions, the prevention of incidents and accidents, and the mitigation of any effects in a way to ensure at a maximum level the occupational and public protection from ionizing radiation of the nuclear facility.

"Object with sources of ionizing radiation" means the location together with the complex of protective means, designated for use of a source or production of a source, or for performing an activity with a source in order to conduct technical maintenance, installation, dismantling, measurements, repair or other services for source users, including source storage.

"Occupational exposure" shall be all exposure incurred by persons occupationally engaged in activities subject to regulatory control under this Act, and in the activities associated with regulatory control.

"Physical protection" means a set of all technical and organizational requirements, measures, means and methods intended to effectively prevent unauthorized tampering or interference with, or unauthorized removal of, nuclear material, nuclear facilities and radioactive substances (theft, intrusion into the site of a nuclear facility, unauthorized access to areas vital to the safety of the nuclear installation, sabotage, terrorist actions), their timely detection, and recovery of misappropriated nuclear material.

"Protected areas" (Protected Sites) as per Biodiversity Act (NATURA 2000) are sites subject to appropriate special protection and conservation regime according to the requirements set up by two EU's two Directives - Directive on the conservation of wild birds (Birds Directive) and Directive on natural habitats and of wild fauna and flora (Habitats Directive). These EU directives require from the member-states to put under special protection and conservation regime wildlife and nature habitats, as well as rare European species. In order to be applied in Bulgaria, texts of these two directives were transposed in the Bulgarian Biological Diversity Act (Biodiversity Act), where the NATURA 2000 network sites are called Protected Areas. The Protected Areas (Special Areas of Conservation) as per art. 3 (1), p. 1 are designed for protection and recovery of the favorable conservation status of the hosting natural habitats as well as of the species in their natural living areas. In the Protected Area can be implemented human activities which do not deteriorate the habitats, subject to a protection in the area.

"Public exposure" means the exposure incurred by members of the public as a result of lawful or unlawful practices with sources of ionizing radiation, excluding any occupational exposure, medical exposure and the normal local natural background radiation typical of a specific working or living environment.

"Radiation accident" means an unintended event that leads or may lead to exceeding the limits or to violation of the conditions of the radiological impact on humans and the environment as established in the nuclear safety and radiation protection standards and rules.

"Radiation monitoring" means the measurement of radiation or other parameters for reasons related to the assessment or control of exposure to radiation, as well as the interpretation of the results.

"Radiation protection" means a totality of organizational and technical measures intended to protect people from exposure to ionizing radiation, including ensuring the safety of sources of ionizing radiation and the activities with such sources, i.e. minimization of the risk of unwarranted exposure, of the number of persons exposed, or of the exposure incurred by humans without exceeding the statutory dose limits, prevention of a radiological emergency, and mitigation of its effects.

"Radioactive source" means a source whereof the properties to emit ionizing radiation are attributable solely to the contained radionuclide.

"Radioactive waste management" means all activities involved in the handling, pre-treatment, treatment, conditioning, storage and disposal of radioactive waste, excluding their transportation out of the site. It could include also the admissible releases.

"Radioactive waste" means a radioactive substance in a gaseous, liquid or solid form for which no further use is foreseen by the licensee or permit holder and which is controlled as radioactive waste by the Agency according to this Act, including a radioactive source for which the safe operating lifetime has ended according to the design documentation.

"Release from regulatory" control is a regulatory activity, as per the ASUNE, performed by the licensee or permit holder, in view of exemption of further activities (disposal in repository, recycling, reuse etc) related to handling of radioactive substances or materials, from the regulatory control under this act and under the relevant regulatory acts on its application.

"Safety assessment" means a review of all aspects of the design and operation of a nuclear facility or another source of ionizing radiation which is relevant to its safety and to the protection of persons, including an analysis of the provisions for nuclear safety and radiation protection and of the risks associated with normal operation and with accidents.

"Source of ionizing radiation" or "source" means any apparatus, radioactive substance, unit, product, installation or facility capable of emitting ionizing radiation or of releasing radioactive substances (with the exception of nuclear facilities).

"Spent fuel management facility" means any facility in which the primary purpose is spent fuel management, including the nuclear facility in decommissioning if it was defined under the law as a facility for RAW management.

"Storage" (*nuclear*) means the holding of nuclear material or radioactive substances, including spent fuel or radioactive waste, in a facility that provides for their containment, with the intention of retrieval.

"Temporary storage" means an operation related to the storage of waste at the place of generation or upon collection for a regulatory fixed time period.

"Treatment of waste" shall be the collection, storage, recovery or disposal of waste and all intermediate operations, as well as the reuse, recycling and reclamation of waste, or production of energy or extraction of materials from waste.

"Waste land filling" (disposal) is a method which does not envisage further treatment of the waste and consists in storage of waste for a period longer than three years (applicable to waste destined for recovery) and one year (applicable to waste destined for disposal) in a manner which does not present risks to human health and the environment.

"Waste management" shall be the operations comprehended in the collection, transport, recovery and disposal of waste, including the supervision of such operations and after-care of treatment installation sites.

"Waste" means any substance, object or part of an object which the holder discards or intends or is required to discard.

13. EIA CONTACT PERSON DATA

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