

# **Environmental Impact Assessment Report for the Decommissioning of Units 1 to 4 at Kozloduy Nuclear Power Plant**

## **INTRODUCTION**

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## Introduction

### *1.1 Background, justification and purpose of EIAR development*

In November 1999, the Bulgarian Government and the European Commission signed a Memorandum of Understanding in which the Bulgarian Government was committed to shut down and decommission Units 1 to 4 of Kozloduy Nuclear Power Plant (KNPP) at the earliest possible date, beginning with the closure of Units 1 and 2 at the end of 2002. A commitment for closure of Units 3 and 4 at the end of 2006 was signed at later date. In consequence all four units were shut-down at the agreed time.

Taking into account the financial consequences of early closures, as well as the need of competitive energy sector, the European Commission has offered a multi-annual assistance package for Bulgaria's energy sector dedicated for assistance to the nuclear energy sector for the decommissioning of Units 1 to 4 of Kozloduy NPP (KNPP), as well as for assistance to the energy efficiency field. In connection therewith the Kozloduy International Decommissioning Support Fund (KIDSF) was established in June 2000, administered by the European Bank for Reconstruction and Development (EBRD).

In regard to this obligation the original Decommissioning strategy was updated (the original strategy is presented in the Technical project for decommissioning of KNPP Units 1 and 2 [8]) to include the decommissioning of KNPP Units 3 and 4, in order to reflect:

- The commitments undertaken by the Republic of Bulgaria for early closure of Units 1-2 and 3-4;
- The application of the international decommissioning experience;
- The current legislation of the Republic of Bulgaria;
- The considerations related to the social and economic consequences of the early closure of Units 1-2 and 3-4.

Currently Units 1 and 2 have a license issued by the Bulgarian Nuclear Regulatory Agency (BNRA) as RAW management facilities subject to decommissioning. Units 3 and 4 have licenses issued by the BNRA as RAW management facilities subject to decommissioning.

Currently the SNF from Units 1-4 has been removed from the Units and is placed at the SNF storage.

Units 3 and 4 of Kozloduy Nuclear Power Plant EAD were declared as RAW Management Facility subject to decommissioning and their property is entrusted for management to SE"RAW" by Decision of the Council of Ministers (DCM) of Republic of Bulgaria (DCM 1038/19.12.2012). [221]

The license for decommissioning of Units 1 and 2 is expected to be received in mid 2013, and for Units 3 and 4 – at the end of 2013, as a facility for RAW management with the goal to prepare the necessary documentations and technical equipment for decommissioning.

The Investment Proposal (IP) consists in the decommissioning of KNPP Units 1-4. KNPP. State Enterprise "Radioactive Waste" (SE RAW) is the Proponent of this IP.

The Environmental Impact Assessment Report (EIA-R) is an important prerequisite for conducting the licensing procedure to obtain a permit from the BNRA competent authority to start the decommissioning activities for KNPP Units 1-4.

In order to fulfil the requirements of Article 4 from the *Regulation on the Terms and Conditions for Conducting Environment Impact Assessment of Investment Proposals for Construction, Activities and Technologies*, published in SG 3/10.01.2006, the necessary notification documentation has been submitted to the MEW regarding the IP “Decommissioning of KNPP Units 1-4”. In this regard notification letters have been sent as well to the mayors of the affected municipalities and other stakeholders.

According to letter Ref. No 26-00-770/22.04.2008 the MEW, as the competent authority for decision making on the EIA for this IP, has formulated the necessary instructions for conducting the IP EIA procedure, including the elaboration of Terms of Reference for determining the scope and content of the IP EIA.

The Terms of Reference for determining the EIA scope have been prepared based on the recommendations in MEW letters Ref. No 26-00-939/02.07.2010 and 26-00-2722/30.09.2011, with consideration of the opinions of the consulted stakeholders, including the expressed position of Romania for participation in the EIA procedure in transboundary context and the considerations of the Romanian Ministry of the Environment and Forests regarding the scope of the assessment, received by MEW letter Ref. No 26-00-939/19.10.2010 and MEW letter ref. No 26-00-693/24.08.2012, as well as based on Article 10, Paragraph 3 from the *Regulation on the terms and conditions for conducting of EIA* (approved by CMD No 59/2003, amended by CMD No 302/2005).

Based on letter Ref. No 26-00-693/24.08.2012, the MEW has approved the Terms of Reference for determining the scope and content of the EIA-R and has recommended the start of its preparation.

The aim of the Terms of Reference for determining the scope and content of the Environment Impact Assessment Report for this Investment Proposal is to assess and compare the impacts from the proposed decommissioning of KNPP Units 1-4, related to the considered alternatives for its execution, regarding the environment and the people, in compliance with the Environment Protection Act [3], the Regulation on the terms and conditions for conducting of EIA [2], the European EIA Directive [46], the EBRD Environment procedures [47], as well as the special EBRD requirements regarding category “A” projects [47-49] and to recommend the most suitable alternative. Units 1 and 2 are equipped with WWER-440 reactors, model B-230, and Units 3 and 4 are equipped with WWER-440 reactors, improved model B-230.

The Investment Proposal for decommissioning of KNPP Units 1-4 is based on the developed Decommissioning Strategy, which has been updated in the process of analysis and assessment, considering all technical, economic and social aspects and based on the international experience to the selection of the continuous dismantling decommissioning alternative. According the Updated Decommissioning Strategy, after expiration of the transitional period under the valid licenses, the decommissioning stages are:

- *Stage 1*: Preparation of Safe Enclosure (SE) and Operation of SE for 5 years and Dismantling outside the SE area, and

- *Stage 2: Dismantling inside the SE area*

In order to execute the decommissioning process in these two stages, a preliminary stage is planned, determined as *Pre-Decommissioning Stage (PDS)*, during which the necessary supporting projects are planned. The most important of them are the following infrastructure projects:

- Size Reduction and Decontamination Workshop;
- Facility for Treatment and Conditioning of RAW with High Volume Reduction Factor (Plasma Melting Facility – PMF)
- Sites for Management of Materials Generated by the Decommissioning Activities of Units 1-4 at Kozloduy Nuclear Power Plant (Decay Storage Sites for Transitional RAW and Site for Conventional Waste from Decommissioning).

For the final Stage of close down and reclamation, the strategy foresees in long-term plan the final state of the industrial site where KNPP Units 1-4 are being decommissioned to be defined as “brown lawn”. It will be achieved by performance of the following activities: dismantling of the equipment not intended for further use; free release of the buildings and facilities remaining in operation; processing and taking out of all RAW from the site and bringing it to a condition suitable for nuclear purposes or other economic activities.

The two-stage decommissioning strategy (stage 1 and stage 2) and the above-mentioned projects require a licensing procedure for getting a permit from the competent authority BNRA.

The decommissioning of Units 1-4 will take place simultaneously with the operation of Units 5-6 and the DSNF storage, which have passed separate EIA procedures [37, 87]. A major project related to the Units decommissioning activities is the construction of a National Disposal Facility for short-lived low and intermediate level radioactive waste (NDF) near KNPP. This project is subject to a separate EIA procedure, approved by the MEW. Other important project related to the decommissioning activities of Units 1-4 of KNPP is the Facility for Treatment and Conditioning of RAW with High Volume Reduction Factor (Plasma Melting Facility – PMF). For this IP separate EIA procedure is ongoing.

The process of consultations on the EIA-R structure and content began in 2008 with the submission of the EIAR ToR to the MEW and the stakeholders.

NPP decommissioning is described in Appendix I of the ESPOO Convention [184]. In this regard an EIA Procedure in Transboundary context has been initiated and Republic of Romania has been notified about the IP as concerned party according the EIA Convention in Transboundary Context. Upon receipt of the relevant notification, the Romanian government decided to participate in the EIA procedure. The specific requirements formulated in this aspect by Romania have been considered in the present EIA-R.

### **1.1.1 Methodology for EIA-R elaboration**

The ToR for determining the EIA scope and content [9] and the necessary structure of the report serve as the basis of the present study.

The EIA R elaboration has been assigned to a team of independent experts possessing the necessary competence according to the Bulgarian regulations, based on a contract between the Contracting Authority and the consortium between EWN – Germany and Energy Institute JSC – Bulgaria.

The experience accumulated during Greifswald NPP (KGR) decommissioning project, which is currently 80% completed, together with the experience by the team of experts, forms the basis for the estimation of the impacts from the decommissioning of the KNPP Units 1 to 4. This experience is summarized in the EWN Decommissioning Environmental Impact Register [50].

The estimation of the impacts is based on the comparison of the Greifswald NPP (KGR) specific conditions with the KNPP site conditions as described in chapter 11 section 11.2.1 of this report.

## **1.2 EIA-R scope**

Chapter 1 of the EIAR describes the characteristics of the IP for the decommissioning of KNPP Units 1-4, the current status of KNPP and its site, and delineates the area subject of the decommissioning of KNPP Units 1 to 4. Chapter 2 provides review of the studied alternatives and gives the reasons for the selection of the suitable alternative. Chapter 3 of the EIA-R provides description of the environment (including Romanian territories part of the assessed 30-km area of impact) with a focus on the areas that may be affected by the decommissioning.

The impacts on the components and factors of the environment are assessed in Chapter 4, also presenting the EWN experience in Greifswald NPP decommissioning and the respective comparison with the KNPP conditions, and sections 4.1 to 4.15 include the assessments made by the team of certified experts. The above described impacts on the Romanian territories are summarized in section 4.16 and in the appended to the EIAR standalone document summarizing the EIA transboundary aspects of the investment proposal.

The methods for analysis and assessment of the impacts on the environment and human health used by the experts are presented in Chapter 5 of this report.

The results from the experts' assessment led to the proposal of measures for mitigating, preventing or terminating the significant harmful impacts on the environment (Chapter 6).

Chapter 7 systemizes the opinions expressed by the concerned population as well as by the decision taking authorities on EIA and other specialised authorities, as a result of the performed consultations.

The conclusions of the experts regarding the anticipated impacts on the environment and on the human health resulting from KNPP Units 1-4 decommissioning activities are summarized in EIA Chapter 8.

### ***1.3 Background for the EIAR Elaboration***

<b>N</b>	<b>Denomination</b>	<b>Author</b>	<b>Year</b>
1.	Information for assessment of the need for EIA for the decommissioning of KNPP Units 1-4 <b>KPMU/IEA/001_0</b>	Ts. Ignatova Environmental Expert St. Velikov S/L/E expert	2009
2.	Terms of Reference for determining the scope and content of EIA for IP “Decommissioning of KNPP Units 1-4, Rev. 4a, <b>SD RAW, 2012.</b>	A. Todorova Project Manager	2012
3.	Strategy for decommissioning Units 1-4 KNPP <b>KPMU/DCS/001</b>	Kozloduy NPP	2006
4.	Strategy for management of SNF and RAW and decommissioning of KNPP Units 1-4	KMPU/DCS/001, Revision 0 MEET	2011
5.	Plan for decommissioning of KNPP Units 1-2 <b>KPMU/DPL/001</b>	KPMU	2008
6.	Plan for decommissioning of KNPP Units 3-4 <b>KPMU/DCP/002</b>	KPMU	2011
7.	Safety Analysis Report during decommissioning of KNPP Units 1-2 , <b>KPMU/SAM/006.0</b>	KPMU	2012
8.	Safety Analysis Report during decommissioning of KNPP Units 3-4, <b>KPMU/SAP/001</b>	KPMU	2011
9.	Safety Analysis Report during operation of KNPP Units 3-4, as RAW management Facilities <b>KPMU/SAO/002</b>	KPMU	2012
10.	Technical specification for design and construction of a decontamination and fragmentation workshop, rev. 5/29.01.2010, Vol. III.ii	KPMU	2010
11.	Feasibility study for the organization of facilities and sites for temporary safe enclosure of category I RAW, non-radioactive waste and materials from the decommissioning activities, rev. 1 april 2011, Vol. III.ii	KPMU	2011
12.	Technical specification for the construction of locations for storage of RAM/RAW category I and non-radioactive materials from the decommissioning of KNPP Units 1-4, rev. 0/10.2012, <b>KPMU/DSS/005</b>	KPMU	2012
13.	Experience from the decommissioning of GREIFSWALD NPP – Germany, EWN, Decommissioning Environmental Impact Register, 2009	EWN	2012
14.	Radioactive waste management principles, Safety standard 111-F	IAEA, Vienna	1995



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15.	IAEA Safety Standard Predisposal Management of Low and Intermediate Level Radioactive Waste	IAEA Vienna	2003
16.	IAEA TECDOC-1492 Improvements of radioactive waste management at WWER nuclear power plants	IAEA Vienna	2006
17.	IAEA TECDOC-1527 Application of thermal technologies for processing of radioactive waste	IAEA Vienna	2006
18.	RCMIW Permission to act, issued by RIEW-Vratsa, 03.01.2011	KNPP	2011
19.	Integrated RAW management program in KNPP ID № DOD.ED.PM.387/05., 2011	KNPP	2011
20.	Units 1-4 and AB-1, 2 RAW management program ID P.IE-02/M2.	KNPP, EP-1	2012
21.	Radiation monitoring program during KNPP operation	KNPP	2011
22.	Internal monitoring program of the Storage for non-radioactive municipal and industrial waste, ID № UK.UOC.PM.011/03, 2011	KNPP	2011
23.	Internal non-radiation water monitoring program, ID № UK.UOC.PM.011/03, 2011	KNPP	2011
24.	Annual reports on the results from KNPP radiation monitoring for 2009, 2010, 2011	KNPP	2009, 2010, 2011
25.	Annual reports on the results from KNPP radioecological monitoring for 2009, 2010, 2011	KNPP	2009, 2010, 2011
26.	Annual reports on the results from the internal non-radiation monitoring (NRM) of the environment in the KNPP area for 2009, 2010, 2011	KNPP	2009, 2010, 2011
27.	KNPP annual report on the occupational dose for 2011, issued by Control Centre “Personal dosimetry” of KNPP “Safety and quality” department	KNPP	2011
28.	KNPP EP-1 Summary report “Liquid and gaseous releases in the environment from EP-1” for 2009, 2010 and 2011	KNPP	2012
29.	Summary of the generated and submitted RAW from Units 1-4, AB-1 and AB-2 of SE RAW – Kozloduy for the period 2009-2011	KNPP	2012
30.	SE RAW internal operational documents, concerned the preparation and decommissioning activities	SE RAW	2011
31.	NSI information on the population in districts Vratsa and Montana for the period 2009-2010, by NSI letter 92-00-14/30.05.2012	NSI	2012



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32.	Information from the Romanian Ministry of Environment and Forests on the Romanian part of the KNPP 30-km area, letter 2830/31.07.2012	MEW	2012
33.	KPMU letter KPMU/EWN/EID/12-005 from 29 .03.2012 on the current status of DP projects	KPMU	2012
34.	Written information about the presence of IP on the territory of PA “Zlatiata” for protection of the wild birds, PA “Zlatiata” for protection of the natural habitats and PA “Tsibar” for protection of the natural habitats, prepared by RIEW-Montana	RIEW Montana	2012

Detailed information about the used literature and legislation is included in Chapters 5 and 9.

### ***1.4 Information on the Contracting Authority (Proponent) for the Investment Proposal***

<b>Contracting Authority (Proponent):</b>	SE "RAW" UIC: BG131218471
<b>Head office:</b>	52, Bul. G. M. Dimitrov, floor 6 Sofia, Bulgaria
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### ***1.5 Brief presentation of the Investor and the Investment program***

The **State Enterprise “Radioactive Waste” (SE RAW)** has been established in accordance with the requirements of the Law on Safe Use of Nuclear Energy with the purpose of national RAW management outside the facilities where the waste is generated. RAW is generated as result of the activities contributing benefit to the society, such as nuclear power engineering and use of sources of ionizing radiation in medicine, industry, agriculture, science and education, and thus cannot be avoided. The purpose of RAW management is to control, minimize and properly manage the waste in order to protect the population and the environment from its negative impact now and in the future without burdening the future generations. Other activities of the enterprise include management of nuclear facilities decommissioning processes, in particular KNPP Units 1-4.

SE RAW policy follows the national policy in the area of spent nuclear fuel and radioactive waste (RAW) management, which is based on internationally accepted RAW management principles:

- Nuclear safety and radiation protection priority over all other aspects of RAW management;
- Maintaining the lowest possible reasonably achievable level of influence of the ionizing radiation and other negative impacts on the personnel, the population and the environment;
- Information provision and open dialogue with the society, including risk assessment and the necessary resources in order to achieve awareness of these risks and the necessity of spending the resources;
- Effective cooperation with the state authorities, other RAW management organizations and with the RAW generators;
- Ensuring continuity and consideration of the contemporary tendencies by enhancing international cooperation and implementing internationally accepted experience.

In pursuance of the national policy for RAW management and the environment SE RAW management staff sets the following main objectives:

- Construction of a National disposal facility for low and intermediate level radioactive waste.
- Modernization of the existing facilities in the specialised RAW divisions in order to improve RAW management, reduce the impact on the environment and improve the facilities safety.
- Maintaining of professional qualification of the enterprise personnel.
- Planning and execution of activities aimed at improving the safety culture and encouraging the personnel for critical attitude to the work done in order to achieve the planned results.

Regarding the relations with the stakeholders:

- Providing information regarding the management decisions;
- Organizing and execution of regular meetings with the population in the areas where the enterprise facilities are or will be located.
- Regarding “Work health and safety”:

- Ensuring appropriate conditions of work and rest;
- Training of professionals entitled by the management to ensure work health and safety.

Regarding quality the management is committed to:

- Maintain and improve the existing management system and to ensure conditions and resources for its continuous improvement;
- Execute planned organisational, financial and technical activities to achieve and maintain the quality of management of the enterprise activities.

### **Licensing system**

SE RAW is subject to state supervision by the Bulgarian nuclear regulatory agency (BNRA) at the Council of Ministers, the Ministry of Environment and Waters and the Ministry of Health.

Following the Council of Ministers Decision to declare Units 1 and 2 facilities for management of radioactive waste (RAW), on 18.10.2010 BNRA terminated the operation licenses for Units 1 and 2 of Kozloduy NPP. Licenses for the two units as facilities for RAW management subject to decommissioning are issued by the State Enterprise "Radioactive waste".

By Decision of the Council of Ministers № 1038/19.12.2012, Units 3 and 4 of Kozloduy NPP were declared as facilities for management of radioactive waste (RAW) and together with the necessary assets are declared privately owned and their management is provided for the management of SE RAW [221]. Currently, Units 3 and 4 have licenses issued by BNRA as facilities for management of radioactive waste.

In a letter to the MEW ref. № OVOS-289/09.01.2013 confirms that SE "RAW" should be considered the sole Proponent of the project "Decommissioning of Units 1-4 of NPP "Kozloduy" in the EIA procedure.

The necessary permissions from BNRA for modifications in constructions, systems and equipment (implementation of technical solutions) and in internal rules for performance of important activities related to the safety of the nuclear facilities at Kozloduy NPP site, have been received when needed.

### **Decommissioning**

In 2011 the execution of the preparation activities for decommissioning of the shut down 440-MW Units of Kozloduy NPP continued, including strategic planning, preparation of the license documents and management of the projects, supporting the related activities. On 05.01.2011, the Updated strategy for management of spent nuclear fuel and RAW until 2030, was adopted with a Council of Ministers Decision. The long-term state of the industrial site where KNPP Units 1-4 are being decommissioned is defined as "brown lawn". It will be achieved by performance of the following activities: dismantling of the equipment not intended for further use; free release of the buildings and facilities remaining in operation; processing and taking out of all RAW from the site and bringing it to a condition suitable for nuclear purposes or other economic activities.

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The management of the activities related to the stopped 440-MW Units of Kozloduy NPP is in compliance with the developed and Updated Strategy for Decommissioning of Units 1-4.