

RADIOACTIVE WASTE MANAGEMENT AT KOZLODUY NUCLEAR POWER PLANT - CURRENT STATUS

A. Alexiev, G. Genchev
KNPP Plc (Bulgaria)

ABSTRACT

In this presentation is described the approach chosen by KNPP for treatment, conditioning and storage of the conditioned LILW.

For management of RAW 2001 it was built a separate Facility. It is placed on-site, very close to units 5 and 6 of KNPP and contents two installations – for treatment of Solid RAW and for conditioning of liquid and solid RAW. Close to the RAW treatment-and conditioning facility is built a surface temporary storage for the conditioned RAW. It is already licensed for operation by the Regulatory body.

For treatment of the solid RAW is chosen the compaction method. The base technology used for conditioning of the treated solid and liquid RAW is cementation.

The package for transportation and storage of conditioned waste is a steel-concrete container, A-type according to and IAEA standards.

At the present the facility is in the final phase of commissioning - experimental operation and is under licensing process by the Bulgarian Regulatory Body – the Nuclear Regulatory Agency.

The original design and the equipment of the facility allows an implementation of additional schemes for treatment and conditioning of RAW, in respect to minimization of the end product for long term storage end/or disposal. In the presentation is discussed the implementation of such approach and the technical means, adopted and especially developed for this purpose, too.

INTRODUCTION

The management of RAW is an important safety aspect in the KNPP operation. Bulgaria has signed 1998 and ratified by law 2001 the Joint Convention on the safety of SF management and on the safety of RAW management [1]. According to the Joint Convention, KNPP takes the necessary measures to fulfill its obligations in the area of RAW management.

The commissioned facilities for RAW management are an appropriate solution for the LILW processing and temporary on-site storage during all the period of KNPP operation. The existing equipment and the experience are good basis for optimization of the technological processes in respect to minimization of the end product for long term storage end/or disposal. An overview of the status and the main results in this direction are presented below.

FACILITY FOR TREATMENT AND CONDITIONING OF RADIOACTIVE WASTE

This is a separate facility for pre-treatment, treatment and conditioning of radioactive waste generated at Kozloduy NPP.

The technology for conditioning of both solid and liquid waste is based on cementation method.

There are two technological lines in the facility.

“Solid radioactive waste” line

It is designed for sorting and compaction of solid radioactive waste in order to reduce the volume and to prepare them for further conditioning. The treatment includes compaction of solid waste in 200 L drums and supercompaction of the drums. Main equipment:

- Solid RAW receiving and reloading junction.
- Sorting table.
- Two 50-tones pre-compactors.
- 210-l drum lid machine.
- Radionuclide content scanning system.
- 910-tones Super-compactor.
- Crane – manipulator.
- Transportation and lifting devices.

“Liquid radioactive waste” line

It is designed for treatment and conditioning of liquid waste, including packing. The technology for liquid RAW conditioning includes following processes:

- Pumping out of liquid RAW from the storage tanks in the nuclear unit's auxiliary buildings
- Transportation to the RAW processing
- Concentration of the liquid RAW (if necessary) through evaporation, pH correction,
- Dosage of liquid RAW, cement and additives,
- Mixing, homogenizing and filling the mixture in package (container).

Main equipment:

- Specialized transport tanker-trailer 12 m³.
- Liquid RAW unloading section.
- Two receiving tanks - 40 m³ each.
- “LUWA” evaporator.
- Two tanks for concentrated liquid RAW – 12 m³ each.
- Silos, transportation and proportioning devices for cement and additives.

- Mixing unit.
- Transportation and lifting devices, pumps, tanks, etc.

Package

The steel-concrete container used according BNS [2] is licensed by the Regulatory body as a package for transportation and storage of conditioned waste. Main characteristics of the container:

- External dimensions 1.95x1.95x1.95 m.
- Weight – 6 tones.
- Net Volume – 5 m³.

The so conditioned waste are temporary stored on - site of Kozloduy NPP and are subject to further disposal without any additional processing.

A view of the facility is shown on Poster desk.

An additional system for decontamination of metal RAW is designed and now is under construction in the facility's building.

STORAGE FACILITY FOR CONDITIONED RADIOACTIVE WASTE

The storage facility is designed for intermediate storage (prior to disposal) of the conditioned waste from Kozloduy NPP. It is a surface steel-concrete facility with adequate engineering barriers protected the operating personnel and the environment. It has been constructed close to the facility for treatment and conditioning of RAW.

The capacity is 1920 steel-concrete containers with conditioned waste (960 containers in two fields, 4 stacks one over the other). The transportation operations in the storage facility are performed by two overhead cranes of 25 t lifting capacity each (one per each field), equipped with holding devices for racking and positioning of the containers.

A view of the storage facility is shown on Poster desk.

OPTIMIZATION OF THE RADIOACTIVE WASTE PROCESSING TECHNOLOGIES

The main purpose is volume reduction of the end product, conditioned for long term storage end/or disposal.

Differential approach is applied for conditioning of solid waste depending of their radionuclide characteristics:

1. Conditioning together with liquid RAW trough inclusion of supercompacted solid waste drums in cemented liquid waste matrix;

2. Conditioning through inclusion of supercompacted solid waste drums in non-radioactive cement matrix;
3. Packaging of supercompacted solid waste drums in reinforced concrete container without immobilization in matrix.

The possibility for implementation of such approach is based on:

- Classification of the solid LILW in sub-categories according to the Bulgarian legislation [3]
- Temporary storage of RAW packages on-site
- Adjustment of clearance practices
- Development of methods and technical means for precise sorting of the RAW

Data analyze of the treated last 8 year solid RAW allows extracting criteria for their sorting in three different groups depending on the radionuclide content. It was designed an appropriate system for scanning and dividing of the RAW during the sorting procedure. The technical means are implemented in the frame of modification [4] in the original design of the facility for treatment and conditioning of RAW.

The overall view, scheme of the system and examples of output data are shown on the Poster desk.

REFERENCES

- 1 Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management, IAEA, Vienna, 1998.
- 2 Steel-concrete container for transportation and storage of conditioned RAW, ON 01 85755-92, Committee on standardization and metrology, Republic of Bulgaria.
- 3 Regulation No. 7, Bulgarian Nuclear Regulatory Agency, 07.01.92.
- 4 Modification No. RAO-TR-041/20.08.03, KNPP.