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Updates on LILW Disposal Facility in Slovenia

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ABSTRACT

Planed near-surface silo disposal facility for low and intermediate level waste (LILW) in Vrbina, Slovenia gained the environmental license in a year 2021 and early in year 2022 the Slovenian nuclear safety administration issued a consent for a construction. Construction license for a nuclear facility was issued in the year 2022 and for the infrastructure the construction license was gained early this year. The public procurement process for infrastructure and technical security was published at the end of last year and the contractor was selected. The tender for the LILW disposal container contractor was successfully finished as well. The tender process for the nuclear facility construction was published in June 2023 and for the crane the public procurement process is planned to be published by the end of this year.

In the last few years extensive research of concrete mixtures for primary and secondary lining of the silo in laboratory as well as on the field was done. Currently investigations for backfilling grout for the container are underway. First construction works started in August 2023.

1 INTRODUCTION

The project started in the year 2004 with sitting process which finished with approved Decree on national planning (DPN) by the government in a year 2009. This document selected site Vrbina in municipality Krško together with the disposal concept as a near-surface silo. The extensive field investigations at the location followed and first safety assessment for this location and disposal concept was prepared. The final design for the facility was done in 2015 [1]. First Environmental impact assessment report (EIA) was prepared in a year 2017 [2] with several revisions, the last being in 2021 [3]. Preliminary safety report [4] was prepared between years 2016 and 2018, based on which a Preliminary consent for the construction was issued by Slovenian nuclear safety administration (SNSA).

The paper describes the status of LILW disposal facility project in Slovenia and shortly presents the disposal concept.

2 DISPOSAL CONCEPT

The LILW in solid form will be disposed in the near-surface silo. The silo will be situated in low permeable silts; this natural environment represents one barrier. Second barrier is the disposal unit or a silo (Fig. 1). The silo consists of primary and secondary wall and the maintenance shaft. The primary wall is to ensure the excavation pit during this process and is not nuclear important structures, systems and components (SSC). The secondary wall or a silo (disposal unit) is 27.3 m in diameter and 56 m depth [5]. The third barrier is the concrete container N2d. Container's dimensions are 1.95 m x 1.95 m x 3.30 m; net volume is 6.31 m^3, maximum weight is 40 t [5]. Containers will be disposed with gantry crane in 10 layers (Fig. 1) per 99 containers. The voids between containers will be filled with backfilling material.

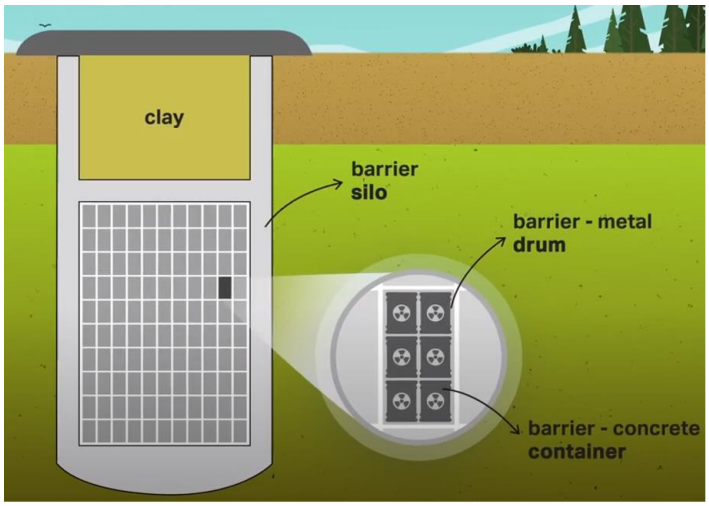

Figure 1: Disposal unit with barriers

At the top the concrete slab will be placed, covered with thick layer of clay. Above that a layer of material from the natural environment will be used. After the closure the disposal unit will become a monolithic structure with no impact to the environment. A 300 years of institutional control in envisioned after which the place will be put into unlimited use.

3 MAJOR STEPS

Based on EIA report [3], Preliminary safety report [4] and Preliminary SNSA consent the environmental consent for the LILW disposal facility was gained in the year 2021. For the phase of construction license the next iteration of safety assessment was prepared; the results were used in a preparation of a Safety report [6]. SNSA issued the consent for the construction early in a year 2022. With this also the concrete container N2d was approved to be used for disposal of RW. The phase of construction license was divided in two parts, for the infrastructure and for the nuclear facility separately. Together with documentation for construction, environmental consent and SNSA consent for construction the license for the nuclear facility construction was issued in July 2022 and for the infrastructure construction in March 2023.

3.1 Public procurement process

For the construction and operation of LILW disposal facility four public procurement process will be prepared. For the concrete container (N2d type) the public tender was published and closed in a year 2022. The contractor was selected in first quarter of this year.

For the construction itself, three tenders will be published. First one is for the construction of the infrastructure and establish physical security which was published early this year. The contractor was selected in first quarter of the year and the works started in August. The second tender is for the construction of nuclear facility and was published in June. The tender is planned to be closed in second half of this year. The last public procurement process will be for the construction of gantry crane and will be published by the end of this year.

3.2 Research on concrete mixtures

From the year 2020 on the activities in searching the proper concrete mixtures for various components of the disposal facility have been in progress.

First the research for the secondary wall of the silo was done. In the three steps the literature screening, laboratory testing of selected mixtures and field studies were performed. The concrete mixture with known qualities was selected in the year 2021. In the next two years the same procedures were done to choose the concrete mixtures for primary silo wall. The final mixture was selected in the year 2022.

Figure bellow shows the blocks of the secondary wall (Fig. 2), the left photo of figure 3 shows the rebar cage of part of primary wall and the right photo shows concrete block cut on half.

Figure 2: Blocks of the secondary wall on the test field.

Figure 3: Rebar cage of part of primary wall (left) and the concrete blocks of primary wall cut on half (right).

This year the research on concrete mixtures for filling mortar for the concrete container N2d are underway. At the same time the technology of filling the container with drums and TTC will be outlined.

Between years 2021 and 2022 the study on gas permeability of the concrete from various barriers was done. The samples were taken from the field samples of primary and secondary silo wall as well as from the container N2d. The results showed that the concrete used has a low permeability for gasses (order of 10^{-18} to 10^{-17} m^2) [7].

3.3 Timeline

The construction of disposal facility will take approximately 3 and a half years altogether. The construction of the infrastructure started in August 2023, and it is expected to be finished early next year. The physical security with the outside fence (around nuclear facility) will be established in the next few months. After the construction of nuclear facility, the trial operation is planned to start in second half of year 2026. Operation is envisioned for year 2027. The facility will operate until 2030 when the standby/idle phase (phase with no disposal or other more extensive work) will start until re-entering the operation in 2049. The remaining "Slovenian" operating LILW generated in the Krško NPP will be disposed, as well as the waste generated during the decommissioning of the Krško NPP. In 2059 the closing of the site is expected, and the long-term monitoring control and maintenance of the site will be initiated. Active long-term monitoring will last for 50 years, and passive for 250 years. After the end of institutional control, the area will pass to unlimited use.

REFERENCES

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