

ANALYSIS OF SPENT FUEL UNDER LONG TERM DRY STORAGE CONDITIONS

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ABSTRACT

The dry storage is a safe and economic intermediate solution contributing to the reduction of the inventory in the used fuel pools while awaiting the development of a back-end fuel strategy: direct disposal or reprocessing and recycling. The dry storage facility is considered as a highly resistant and passive system and experience accumulated over the last years confirmed this statement. One of the prerequisites for confirming the safety of dry spent fuel storage technologies is the ability to predict the spent fuel performance during period of storage.

The paper presents the methodology for evaluation of spent fuel behavior during the long term dry storage. The methodology includes two world wide used code systems: SCALE and TRANSURANUS. The cladding outer temperature in the closed cask has to be calculated by some thermo-hydraulic code and then used by the TRANSURANUS as initial conditions. This could be an object of future studies.

The residual heat rating and fast neutron flux were assessed by the SCALE 6 code system and taken as an input data for the fuel performance calculations. During the three periods of the fuel life (irradiation, cooling and dry storage), the fast neutron flux, linear heat rate and the cooling conditions are considerably different. The TRANSURANUS code allows accounting for the change of the coolant nature (RESTART mode) which is important advantage of the code.

The developed approach of dry storage treatment was demonstrated on the base of a WWER-440 fuel rod, irradiated four cycles in the NPP Kozloduy, Unit 4.

The results, obtained in these first analyses, give grounds to accept that the preliminary assessment of the spent fuel properties are applicable to the problem of analyzing spent fuel behavior under long term storage - both wet and dry one.

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