EFFECT OF THE NEW TYPE FUEL ON THE NUCLIDES CONCENTRATION CHANGE AND THE DECAY HEAT PRODUCTION IN REACTORS

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This paper is focused on effect of the key nuclides concentration change in the new fuel type and their impact on decay heat production in VVER-440 assemblies. VVER-440 reactors are pressurized water nuclear reactors that have been used in the territory of the Slovak Republic - Bohunice area and Mochovce area. These reactors have an installed electrical power of 440 MW_e, but currently, after gradual modernization electrical power have been increased to 500 MW_e.

The aim of the research was to use reprocessed uranium fuel (RepU) to use the energy potential of the original spent fuel (UOX) and to reduce volume of high-level radioactive waste in VVER-440 reactors. Analyses were performed on heterogeneous fuel assemblies with 4,87 % and 4,70 % ^{235}U average enrichment. Both of these fuel assemblies also contain fuel rods with a burnable absorber Gd_2O_3. We used the well-know SCALE6 system for calculations, and within this system we decided to used stochastics code KENO with the Monte Carlo method, which has potential for more complicated fuel-related analyses.

At the beginning, the effort was focused to set an internationally recommendations reference way for suitable pin burnup calculations. Subsequently, we had to find a suitable compensation factor that would minimize the impact of ^{236}U on the reactivity of the reprocessed uranium fuel. Due to this factor ^{235}U average enrichment value was found of the reprocessed uranium fuel to achieve the same k_{inf} values as k_{inf} achieved in the original uranium fresh fuel. Based on the norm (Standard specification for uranium hexafluoride enrichment) a mixed type of fuel consisting of fresh uranium fuel and reprocessed uranium fuel was used. Due to the even uranium isotopes (^{232}U, ^{234}U and ^{236}U) in reprocessed uranium fuel, the maximum weight percentage (%wt) in fuel was determined. Results of using a mixed type of fuel have been shown through the integral and differential following parameters: *k_{inf}, chosen nuclides concentrations* and *total decay heat production*.

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