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#07-226 Study of natural uranium fuel for new reactor design TEPLATOR

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The TEPLATOR is a new type of nuclear reactor which the main purpose is producing heat for district heating. It is designed as a special thermal reactor with 55 fuel channels for fuel assemblies, which is moderated and cooled by heavy water and operated around atmospheric pressure. The TEPLATOR DEMO is designed for using irradiated fuel from PWR or BWR reactors. Using heavy water as the moderator and coolant in this reactor concept allows to use natural uranium as an alternative fuel in case that the irradiated fuel is not available for some reasons. This solution is suitable because of the price of natural uranium and the absence of costly fuel enrichment. This article is focused on deeper analyses of alternative suitable fuel for TEPLATOR based on natural uranium and new fuel geometries. This work builds on previous research on alternative fuel material and geometry for the TEPLATOR. It is mainly concerned with the neutronic development of fuel assemblies, the possibility of manufacturing of developed fuel types and optimization of fuel management and uranium consumption. This article contains predetermined candidates of suitable fuel geometries and new untested types of fuel geometry with some new advantages. Finally, the optimization of the whole reactor core and number of fuel channels in terms of higher safety and higher fuel burnup were made. Presented calculations were performed by Monte Carlo code Seprent.

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