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Criticality and radiation safety evaluation of the canisters that could be used for RBMK-1500 SNF disposal

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It is envisaged that all spent nuclear fuel generated during the operation of the RBMK-1500 reactors at the Ignalina NPP will be stored in dry storage facilities for at least 50 years prior to its disposal into a deep geological repository. According to the Radioactive Waste Management Development Programme (approved in 2015) the construction of the repository is planned to be completed in 2066, and all SNF should be disposed of until 2073. Before the construction of the repository, various preparatory activities shall be performed: site selection, repository concept and designing, environmental impact studies, safety analysis, etc. There are two geological formations in the territory of Lithuania potentially suitable for the construction of the repository – crystalline rock and clayey formations. Dry storage casks that are currently used for RBMK-1500 SNF interim storage at Ignalina NPP site cannot be used for the disposal purposes. Therefore, SNF reloading from the storage casks into appropriate disposal canisters will be necessary. The type of the disposal canister depends on the geological formation in which the repository is constructed. According to the existing knowledge, copper canisters are considered appropriate for disposal into crystalline rock and steel canisters are suitable for clayey formations. This paper presents preliminary criticality and radiation safety evaluation of copper and steel canisters containing RBMK-1500 spent fuel. Radiation characteristics and dose rates on the surfaces of the canisters are modelled assuming SNF disposal after 50 and 100 year interim storage.

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