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Challenges and constraints related to the final stage of the SMR fuel cycle in the light of plans to implement SMR technology in Poland.

The Polish power sector is based mainly on fossil fuel combustion, of which more than 70% represent hard and brown coals. Current climate policy foresees a significant decrease of CO₂ emission to the environment implicating the need for urgent transformation of power industry into a low-carbon sector. The strategic document of the Energy Policy of Poland until 2040 (PEP2040), setting the framework for the energy transformation, states that the decarbonization of the energy sector will be possible thanks to the implementation of nuclear energy and offshore wind energy.

Recently, there is great interest to use small modular reactors which implies the need to carry out a number of works aimed at checking the feasibility of implementing SMR technology in Polish conditions. Among others, there is a necessity to conduct in-depth analyses concerning the final stage of the fuel cycle.

The paper presents a comprehensive analysis of the possibility of deployment of SMRs in Poland including an initial selection of SMR technologies most suitable for use in Polish condition as well as the fuel cycle options for selected technologies. Challenges and constraints related to the management of spent nuclear fuel and ways to counteract them are also taken into account. Additionally, possible ways of management of spent fuel from SMR taking into account the possibility of using innovative methods of reprocessing, including solvent extraction for the separation of actinides has been considered.

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