CENTRALISED SPENT FUEL MANAGEMENT FOR HEAT-PRODUCING SMRs

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District heating is a key component of the modern European energy sector, with a total capacity of approximately 450 TWh. However, more than 60% of this thermal energy is still produced using fossil fuels, highlighting the urgent need for cleaner and more sustainable alternatives. Nuclear energy, as a reliable and efficient power source, has the potential to replace fossil fuels in the district heating sector. Our project focuses on using Small Modular Reactors (SMRs) to generate heat for district heating networks. To address the management of spent nuclear fuel from these reactors, we propose the development of a centralised spent fuel and waste management facility. A key topic of this study will be the fuel management aspects of the nuclear fuel cycle, such as determining the enrichment percentage of nuclear fuel, analyzing the duration of a single fuel cycle, and calculating the amount of fuel required for stable SMR operation. Based on the type of fuel selected as optimal for our SMRs, we will develop strategies for managing it. Once the best approach is identified, a centralised spent fuel and waste management facility will be conceived. The main outcome of this study will be a comprehensive framework for integrating SMRs into district heating networks, supported by an efficient, centralised solution for spent fuel and waste management that ensures both environmental and economic benefits for Europe.

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