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## Optimized Design of Core Scheme for Annular Fueled SMR

SMRs, which are usually characterized by modularity, short construction period and flexible deployment, can be used as a clean distributed energy source for power supply as well as for a variety of purposes, such as seawater desalination, district heating and industrial heating. As the key component of a nuclear reactor, the performance of the fuel element is the most important factor affecting safety and economy. Ring fuel has an inner and outer double-layer shell, and its double-sided cooling structure can significantly improve the heat transfer conditions of the fuel, which helps to reduce the core size and enhance the safety and economy of the reactor. The design of SMRs using annular fuel can increase the power density and reduce the core size under the same safety level, which is more conducive to realizing the miniaturization of SMR. In the paper, the application of annular fuel in small reactors such as low temperature heating reactors, modular reactors and offshore reactors is investigated by adopting the Fuel Management Program Package (CMS) to explore the feasibility of utilizing the advantages of annular fuel in the research and development of SMR. Through the calculation and analysis of the key performance parameters of the low temperature heating reactors, modular reactors and offshore reactors with annular fuel, the parameters such as the power inhomogeneity factor are in line with the requirements of the design guidelines, and the core has good steady-state physical properties, which shows that the application of annular fuel in small reactors is feasible, and that the annular fueled SMRs have a good prospect for development.

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### Confirm that the work is original and has not been published anywhere else

YES

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fuels, reprocessing, waste management and decommissioning aspects for SMRs –Safety, Design and Technology