

DESIGN EVOLUTIONS OF THE MOLTEN SALT FAST REACTOR

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Track 1. Innovative Fast Reactor Designs

ABSTRACT

The CNRS has focused R&D efforts on the development of a new reactor concept called the Molten Salt Fast Reactor (MSFR). The MSFR, characterized by a circulating liquid fuel and a fast neutron spectrum, has been identified as a very interesting long term alternative to solid fuelled fast neutron systems in the Gen4 International Forum.

MSRs are liquid-fuelled reactors so that they are flexible in terms of operation or design choices, but they are very different in terms of design and safety approach compared to solid-fuelled reactors. The MSFR system includes three different circuits: the fuel circuit, the intermediate circuit and the power conversion circuit, together with normal and emergency draining tanks and on-site fuel processing units. This paper will focus on the new designs developed for the fuel circuit and the emergency draining system of the MSFR in the frame of the SAMOFAR European project. The fuel circuit, defined as the circuit containing the fuel salt during power generation, includes the core cavity and the recirculation/cooling sectors. These new designs result from physical and preliminary safety studies such as for the fuel circuit optimizing the use of the molten salt both as fuel and coolant, defining the operating procedures and minimizing the fuel leakage risks. Additional requirements are considered for the emergency draining system to be able to confine the fuel and to evacuate the residual heat over very long time periods (months) with no human intervention and to guaranty that under no circumstance the salt may reach criticality in this area.

Session: 1.7 ADS AND OTHER REACTOR DESIGNS