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The SAIGA in-pile experimental program to qualify the SIMMER calculation tool in SFR Severe Accident Conditions

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The CEA, together with the NNC, has carried out a feasibility study with regard to conducting an in-pile test program - the future SAIGA program (Severe Accident In-pile experiments for Gen-IV reactors and the Astrid prototype) - on the degradation of a SFR fuel bundle with molten fuel discharge device which are planned to be housed in the IGR reactor (Impulse Graphite Reactor operated by NNC-RK). The purpose of the SAIGA program is to qualify the SIMMER computer code on the SEASON platform based on one in-pile test conducted with two fuel sub-assemblies and one discharge tube representative for an in-core mitigation device dedicated to severe accident situations. This test should be representative, as much as possible, for the phenomena encountered during Unprotected Loss-Of-Flow Total (ULOF) severe accident sequences.
A sodium loop will be built and connected to the in-pile experimental device to drive the sodium flow inside the fuel pin bundle with experimental conditions close to the SFR nominal conditions before triggering of the ULOF sequence. Over accidental transient period with sodium flow reduction, the constant neutron heating from IGR reactor will lead to degrade a first sub-assembly (16 Kazakh fuel pins by sub-assembly) to produce some molten fuel material and the propagation of this degraded fuel will be followed by fine instrumentation towards both a second sub-assembly and a discharge tube.
For this scenario, the feasibility study defined the main characteristics of the experimental device and the operating conditions for the test to be conducted in the IGR reactor. The purpose of this study was to assess the capacity of the IGR reactor to provide the necessary neutron flux during the transient, to demonstrate the capacity to carry out on-line or post-test measurements of the variables of interest, and to assess the schedule of one test incorporating the safety file. Also, the sodium loop feeding the test device and its instrumentation were studied and their feasibility demonstrated.

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