

SESAME Project: Advancements in Liquid Metal Thermal Hydraulics Experiments and Simulations

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The thermal-hydraulics Simulation and Experiments for the Safety Assessment of MEtal cooled reactor (**SESAME**) project supports the development of European liquid metal –cooled reactors.

It provides new experimental results and improved numerical approaches, allowing system designers to improve the safety of equipment, which will lead to enhanced safety standards and culture.

LIQUID METAL HEAT TRANSFER

A fundamental issue for the evaluation of liquid metal reactors is the modelling of the turbulent heat transfer over the complete range from natural, mixed and convection to forced convection regimes.

Experimental data used for the assessment of a variety of **advanced turbulent heat flux models**, i.e. the second order TMBF-eq.-ATHFM model, an implicit AHFM model and the AHFM-NRG.

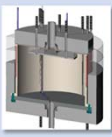



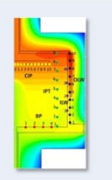
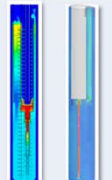
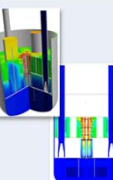
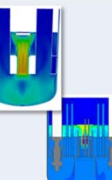
CORE THERMAL HYDRAULICS

Experimental activities on wire- and grid-spaced fuel bundle

- Quasi-DNS simulation data generated for a rod bundle with an infinite number of pins;
- LES data generated for a 61-pin bundle;
- Validation for engineering RANS models;
- Experiment for pin vibration measurements.

POOL THERMAL HYDRAULICS

- Pool thermal-hydraulics is highly design-dependent;
- The development and validation of modelling approaches for pool thermal-hydraulics is not;
- Numerical approaches developed in parallel for pool facilities in CFD have been validated using the experimental data

	TALL (small scale generic)	CIRCE (large scale generic)	ESCAPE (large scale MYRRHA)	Reactor Scale (MYRRHA / ALFRED)
Experiment				
Simulation				

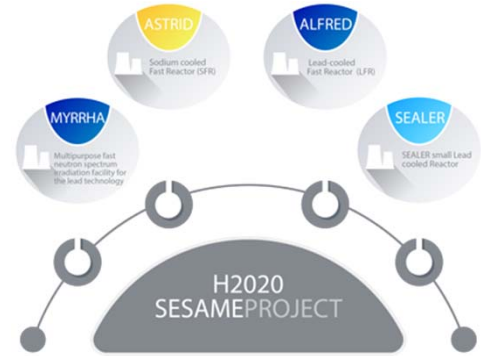
The validation base for liquid metal system thermal hydraulics has been enlarged with new experimental data ranging from a small generic scale, to intermediate scale and large scale experiments, and finally to real reactor scale

SESAME Project

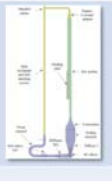
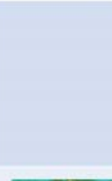
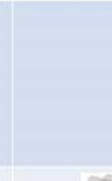


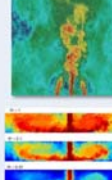
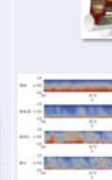
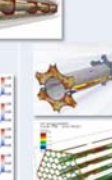
- ~100 people
- 23 European institutes
- 5,2 M€ from the EC
- US partners
- 916 PMs of work
- 60 official milestones
- 98 deliverable

- 5 thesis
- A text book
- 18 journal publications
- 38 peer review conference paper

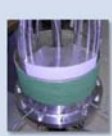





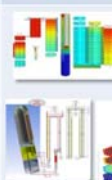

GEN-IV HLM international framework



Overview of reference data produced dedicated to liquid metal heat transfer

	Flow Separation	Jet	Mixed Convection	Rod Bundle
Experiment				
High-Fidelity Reference Simulation (LES / DNS)				

SYSTEM THERMAL HYDRAULICS

	TALL (small scale generic)	NACIE_UP (Intermediate scale)	CIRCE (large scale generic)	Reactor Scale (Phenix)
Experiment				
Simulation				

Experimental activities investigating HLM freezing was designed and constructed in the frame of SESAME project on the SESAME-stand facility

