Development of methods for the control and safety demonstration of Molten Salt Fast Reactors (MSFRs)

Introduction

The SAMOSAFER project, supported by the European Community through an H2020 grant, recently started (Oct 2019) with a 4-years program aiming at "develop and demonstrate new safety barriers for more controlled behavior of Molten Salt Reactors in severe accidents to ensure that the MSR can comply with all expected regulations in 30 years' time" [1].

In SAMOSAFER WP6 "Reactor operation, Reactor control and Safety demonstration", a specific task is devoted to the development of predictive control strategy and incident detection methods. This activity, involving the use of a simulator of the whole reactor plant, aims at identifying the most important parameters affecting the system behavior, in order to develop monitoring strategy useful to timely detect behavior deviations that could lead to accidental sequences.

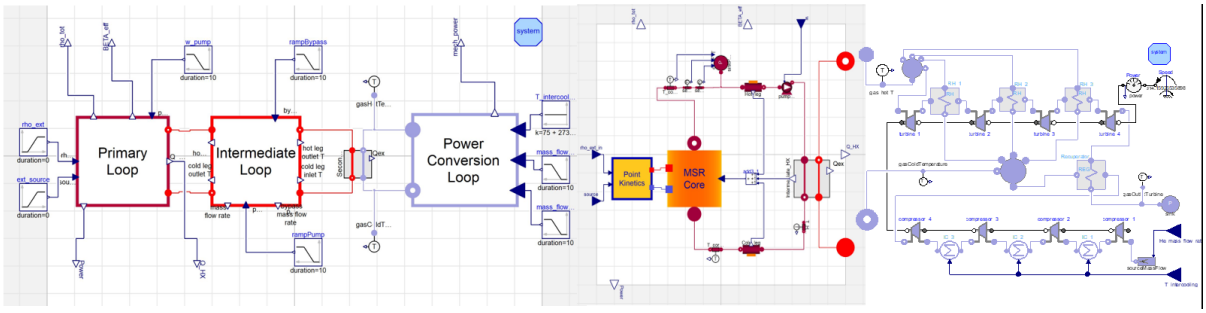

Figure 1: Plant simulator developed in the SAMOFAR project, to be adopted in the proposed analyses.

Aim of the work

In the general framework of the activities foreseen in the SAMOSAFER project, a thesis project can be devised with the following objectives [2]:

- Identification of the important parameters and components that characterize and determine the behavior of the plant, defining normal/abnormal conditions and selection of a subset of such parameters considered feasible to be measured and monitored
- Update of the power plant simulator and inclusion of measurements needed for the incident detection methods
- Identification (by efficient exploration of the MSFR power plant state space) of those configurations of the reactor parameters/components that are capable of leading the system into an abnormal operation state

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References

[1] SAMOSAFER Website, https://samosafer.eu/.

[2] E. Zio, P. Baraldi, N. Pedroni, Selecting Features for Nuclear Transients Classification by Means of Genetic Algorithms, *IEEE Transactions on Nuclear Science*, **53**(3), 1479-1493, 2006.