MSc thesis proposal (stage opportunity in CEA Paris)

▪ Title of the research

Safety analysis of nuclear power plants: quantification of the uncertainty in nuclear thermal-hydraulic codes based on heterogeneous experimental data

▪ Objectives of the research

In the past few decades, there has been an increasing interest in the use of Best Estimate Plus Uncertainty (BEPU) methodologies for the safety analyses of Nuclear Power Plants (NPPs). However, when using Best-Estimate Thermal-Hydraulic (BE-TH) system codes (e.g., ATHLET, CATHARE, RELAP, SPACE, TRACE, etc.) the issue is the identification and quantification of the *uncertainties* affecting the code results. These are due to the physical models implemented in the code and their inputs. The identification and quantification of uncertainty are performed relying on available (heterogeneous) experimental data, within a data analysis framework called Inverse Uncertainty Quantification (IUQ). Within this framework, the purpose of the thesis is to develop innovative methods of IUQ of nuclear TH codes in the presence of *heterogeneous* experimental data. The thesis is performed within an international project called ATRIUM (Application Tests for Realization of Inverse Uncertainty quantification and validation Methodologies in Thermal-Hydraulics) launched by the Nuclear Energy Agency (NEA)/ Committee on the Safety of Nuclear Installations (CSNI)/ Working Group on the Analysis and Management of Accidents (WGAMA). The scope of the project is benchmarking the different IUQ methodologies with respect to physical phenomena relevant to intermediate break LOCA (i.e., critical flow at the break and post-CHF heat transfer phenomena). The methodologies will be developed in collaboration between ENEA, Politecnico di Milano and Politecnico di Torino. Also, an opportunity of stage at CEA CEA Paris-Saclay, site de Saclay, is foreseen.

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