PAUL SCHERRER INSTITUT

NES Colloquium

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Overview of uncertainty propagation methods in the field of reactor analysis

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Recent improvements in computational power have allowed the development of novel computational schemes for nuclear power plant analysis. These new simulation tools produce more accurate results with better resolution. However, residual computational biases still exist and the computational schemes must be supplemented by uncertainty quantification for the community to fully benefit from their enhanced performance.

The presentation will provide an overview of the uncertainty propagation process used at NES/LRT for reactor analysis. Even though the idea behind the propagation of input uncertainty is simple, the challenge specifics to the field of neutron transport will be discussed. Moreover, the practical use of uncertainty propagation for code validation requires additional features like representativity analysis, sensitivity analysis and data assimilation. During the course of the presentation, I will sketch how representativity analysis and data assimilation are done to make the best use of our costly experimental measurements. I will then present in more details some recent work dedicated to the implementation of sensitivity analysis methods in the uncertainty quantification platform used at NES/LRT for reactor analysis. Although the presentation will focus mostly on neutron transport, the applicability of the methods to other fields of nuclear engineering will be addressed.