# SENSITIVITY/UNCERTAINTY ANALYSIS OF THE VALIDATION OF THE EVOLCODE 2.0 BURN-UP SYSTEM WITH PWR EXPERIMENTAL DATA

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*Abstract*

The prediction of the isotopic composition of irradiated nuclear fuels is crucial for studies on burn-up credit, reactor physics and waste management. With this motivation, CIEMAT has been developing, upgrading and validating for the last decade the burn-up simulation system EVOLCODE 2.0.

One of these validations involved the ICE experiment, a whole irradiation of some UO2 fuel assemblies in a pressurized light water reactor (PWR) for a total of around 30 GWd/tU and the later isotopic content experimental measure of U and Pu isotopes. The validation of EVOLCODE 2.0, consisting in the simulation of the PWR with a single pin model, provided very satisfactory results (with mass deviations between the simulation and the experimental data smaller than 3% for the main U and Pu isotopes), with generally smaller mass deviations than those obtained with the deterministic code KAPROS. However, for some actinides the obtained mass deviations are larger than the experimental uncertainties.

The aim of this work is to analyze the simulation uncertainties in the final isotope masses and to comprehend their possible sources. For this reason, we have performed an uncertainty analysis based on the sensitivity methodology, providing the uncertainties in the isotopic content propagated from the cross sections uncertainties, and the energy ranges and isotopes responsible of the major contributions to these uncertainties as well. The COMMARA data library has provided us with both the covariance information and the cross section uncertainties in 33 energy groups.

Preliminary results show that the cross section uncertainties are an important contributor to the simulation uncertainties, sometimes even larger than the experimental and the simulation uncertainties. Besides, some simulation uncertainties for actinides with very small amount are significantly larger than the other uncertainties and need further investigation.

This work is framed within the ANDES project (Accurate Nuclear Data for nuclear Energy Sustainability, 7th Framework Programme of the European Union). Its results will allow us to give some guidelines in order to advise additional strategies for cross section uncertainty reduction.