NEUTRONIC SENSITIVITY AND UNCERTAINTY ANALYSES OF FHR

V. Bécares[1*], S. Panizo[1]

[1]CIEMAT, Avenida Complutense 40, 28040 Madrid (Spain)

vicente.becares@ciemat.es

Abstract

Sensitivity and Uncertainty (S/U) analyses are being increasingly used in the field of neutronics in order to identify the nuclear data that have the highest relevance in the results of reactor calculations and quantify the impact of their uncertainties on these results. These studies are of major importance for directing nuclear data research by determining which nuclear data are in the most urgent need to be improved. For this reason, S/U analyses have been included in the latest European nuclear data projects, such as the recently completed SANDA and the ongoing APRENDE project.

Among the emerging types of advanced nuclear systems, Molten Salt Reactors (MSR) are of particular interest for nuclear data research since they contain isotopes (e.g. fluorine, chlorine) that are usually not present in other nuclear systems, and therefore they have been paid little attention until now. Hence, MSR is one of the advanced reactor families that have been identified as priorities for S/U analysis within the APRENDE project.

In this work, we have developed a neutronics model of the Fluoride-salt High-temperature Reactor (FHR), developed at Oak Ridge National Laboratory (ORNL), using documentation made publicly available in the frame of an OECD/NEA benchmark. Based upon this model, we have performed S/U analysis of the criticality constant and other reactor parameters of FHR, using the SUMMON tool developed at CIEMAT, and identify the nuclear data and reactions which are responsible for the largest uncertainty in the results. In this way, we have expanded the work carried out for other families of advanced nuclear reactors (sodium-cooled, lead-cooled) with the final aim to produce a comprehensive view of nuclear data needs for advanced nuclear systems.

KEYWORDS: SENSITIVITY, UNCERTAINTY, SUMMON, MSR, FHR