Impact of Nuclear Data Uncertainties on Closed Fuel Cycle Scenarios: Preliminary Assessment

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Abstract

Nuclear energy is considered today, despite recent events, a reliable, clean and cost effective energy source. As environment protection and natural resources availability become crucial issues, nuclear research is focusing on innovative reactors and associated fuel cycles able to optimize resources exploitation and nuclear waste management. The proposed fuel cycles employ partitioning and transmutation strategies in order to minimize waste inventories. Implementation of these cycles may influence appreciably parameters such as fuel radiation activity during its fabrication, waste decay heat and radiotoxicity in a final repository. Therefore it is important to assess these parameters, which affect the technical complexity of the proposed cycle options and consequently their costs. It is also important to assess the associated uncertainties, influenced, in particular, by uncertainties in neutron cross-sections of heavy nuclides. For this purpose, different scenarios have been analyzed with the COSI code and NUCLEONICA, the latter being used for decay calculations. The first outcome of these analyses i.e. the assessment of the most important nuclei for the evaluation of doses at fuel fabrication, of decay heat at fuel discharge and in a repository, of waste radiotoxicity, etc. is presented in the paper.