Invited Talk – AMAC – Advanced Methodology for Activation Characterization Analysis of the Radiological Situation of an NPP during Operation and before Decommissioning

Wednesday, 15 November 2023 13:50 (20 minutes)

This work presents an overview of Nagra's AMAC (Advanced Methodology for Activation Characterization), a Monte Carlo (MCNP) based methodology used to simulate the neutron propagation as well as the activation processes during the operation of a nuclear power plant (NPP). By a high-resolution tally-system it is possible to characterize the activation distribution for each major component of the NPP as well as for the surrounding building structures. The resulting nuclide inventories are stored in an NPP specific activation atlas and can be particularly used for NPP decommission planning purposes but also for handling and shielding issues during the plant operation. Attached user-friendly modules to AMAC allow for visualization of the activation distribution and the nuclide activity balancing and bookkeeping for all relevant NPP components. Furthermore, they enable the development of segmentation strategies followed by optimized automated packaging concepts for the decommission waste into an adaptable list of available container types. Thus, AMAC is expected to lead to significant cost savings by reducing the number of expensive waste containers as well as by significantly limiting the number of radiological measurements during NPP decommissioning. The methodology has been validated by activation foil campaigns where samples have been placed at selected locations within the NPP building for a full operation cycle irradiation. Alternatively, destructive sampling followed by radiological analyses have been also conducted for validation and scaling purposes. AMAC has been applied to all Swiss NPPs and research reactors as well as for corresponding nuclear facilities in Germany and South-Korea. Furthermore, its results are the basis for the periodic Swiss cost study for the definition of the size of the NPP decommission and disposal funds. In summary, the application of AMAC leads to the detailed knowledge of the radiological situation caused by activation processes of an NPP during operation and for decommission planning.

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