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Advances in the Development of a Spent Fuel Measurement Device in Belgian Nuclear Power Plants

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One of the research lines at SCKoCEN is focussed on the investigating experimental methods for the burnup determination of spent fuel elements. In the past a version of the so-called Fork Detector has been designed and built at SCKoCEN and is in use at the Belgian Nuclear Power Plant of Doel. The Fork Detector relies on passive neutron and gamma measurements for the assessment of the burnup and Safeguards verification activities. In this assessment, certain information like initial enrichment of the fuel element, the irradiation history and material composition are supposed to be known operator declared data.

An industry sponsored project is on-going to design and build a measurement system which includes both neutron detectors and a medium resolution gamma rays spectrometer, e.g. a Cadmium Zinc Telluride detector. The response of these two detectors can then be used for the determination of the average and axial burnup, relying less on operator declared data.

This paper summarizes the main findings of the projects and the conclusions that have been reached so far on the design of the new measurement device. In particular the used approach based on MCNP calculations and their optimization to reduce the computation time are discussed.

Country or International Organization

Belgium

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