BURNUP CREDIT
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The implementation of burnup credit aims to optimize facilities and transports (as spent fuel storage, transport casks, reprocessing, final disposal…). This optimization leads to reduce the margins due the "fresh fuel" assumption. However, the implementation of BUC should remain a bounding implementation from a safety point of view. For this purpose, one should keep in mind that the methodologies for determining the isotopic composition and the neutron multiplication factor (k-effective) have to be properly validated, that is with a high degree of confidence since the margins are reduced.

Compared to a relatively "basic" criticality calculation with fresh UO2 fuel, the implementation of BUC is much more complicated regarding the number of parameters (history and conditions of irradiation, initial enrichment, burnup, cooling time…), the coupling of depletion calculations and criticality calculations, the number of nuclides taken into account and the space distribution of the burnup.

Each of these specificities raises specific problems or needs: a better knowledge of nuclear data related to actinides and fission products, need of fuel assay analysis, new critical experiment, convergence for Monte Carlo codes, sensitivity to different input parameters…

Due to their complexity, burnup credit calculations could have been considered time-expensive and note accurate enough. However, with the benefit of the computing progress, some efforts are permanently put on enhancing the capabilities of the codes and better assessed the bias and uncertainties.

As an example of these progresses, one will note the existence of more and more Monte Carlo codes used for burnup calculations although they were not considered suitable by the past.

Thus, today codes offer the capability to model more complicated geometries, in 3D for instance, and to perform sensitivity calculations. Indeed, the propagation of uncertainties due to initial parameters and the evaluation of the validation bias is an important key issue of the BUC implementation.

Some tools already exists as TSUNAMI from the SCALE package as an example, but others are under development based on methods as the GLLSM. At this point, I would just mention the work of the UACSA (Uncertainties Analyses for Criticality Safety Assessment) EG of the OECD.