

Research Activities of JAEA Considering the Future Needs of Japan in Burnup Credit Implementation

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In the Rokkasho Reprocessing Plant, actinide-only burnup credit is implemented for storage and dissolving processes of spent nuclear fuels. Inclusion of fission products in burnup credit would be the next step to follow. Nevertheless, burnup credit is not implemented for dry/wet storage or transport of spent nuclear fuels in Japan, except gadolinium credit which has been implemented even for storage and transport of spent BWR fuels. In the criticality safety evaluation of spent nuclear fuels for disposal, implementation of burnup credit should be crucial; however, to reprocess all the spent fuels has been the national policy of Japan, which has delayed our investigation into this field.

For inclusion of fission products in burnup credit, a series of critical experiments were performed that measured reactivity worth of fission product elements using a heterogeneous core at the Static Criticality Experiment Facility (STACY) of the Japan Atomic Energy Agency (JAEA). The relation with a similar experiment was discussed that involved gadolinium dissolved in the uranium nitrate solution, which was also performed at the STACY.

Development of a new version of SWAT code, named SWAT-3.1, was made that allowed the users to utilize not only SRAC code system and MVP code, both of which were developed by the former Japan Atomic Energy Institute (JAERI), but also the world-widely popular Monte Carlo neutron transport code, MCNP5. This version was applied to the OECD/NEA Burnup Credit Phase IIIB Benchmarks and the results were compared with the results of other burnup calculation codes to verify that the SWAT-3.1 would give reasonable results.

According to a suggestion of the Atomic Energy Commission of Japan, the JAEA has been collecting information on the direct disposal of spent fuel. Especially for the criticality issues of the direct disposal, two divisions of the JAEA, i.e., the Nuclear Safety Research Center and the Geological Isolation Research & Development Directorate have started collaboration in doing this.

“A Guide Introducing Burnup Credit, Preliminary Version” was published as a report from JAERI in 2001. Efforts are underway for translating the original Japanese report into English as well as for updating its texts and data.