

TESTING OF RECENT JEF(F) DECAY DATA AND FISSION PRODUCT YIELDS FILES FOR IRRADIATED NUCLEAR FUEL DECAY HEAT CALCULATIONS.

Robert W. Mills, Darren R. Parker

BNFL

The heat generated by irradiated nuclear fuel is one of the important considerations for its safe storage, transport and possible recycling.

One method to calculate the decay heat of irradiated fuel is from an inventory code such as FISPIN [1] or ORIGEN-S [2]. These codes were part of a code comparison that showed that their results, and that of many other codes, were dependent upon the nuclear data used by the code rather than the solution method [3].

This paper compares FISPIN10 decay heat calculations with a selection of fission pulse experiments (U235, U238, Pu239 and Pu241) [4-7] and PWR UOX assembly calorimetry measurements [8]. FISPIN10 can be run with a selection of ENDF/B formatted decay and fission yield files from the JEFF project. Currently libraries include JEF-1 (1986) [9] and JEF-2.2 (1993) [10]. This work also considers a new UK fission product yield file and preliminary decay data file that is being considered for release in the JEFF-3 file.

This work was partially funded by the UK Industry Management Committee.

References

1. Burstall R F, "FISPIN-A computer code for nuclide inventory calculations", ND-R-328 (R), October 1979.
2. SCALE, "SCALE: A Modular Code System for Performing Standardised Computer Analyses for Licensing Evaluation", NUREG/CR-0200, Rev.6, (ORNL/NUREG/CSD-2R6), Vols. I, II, and III (May 2000). Version 4.4a of the code package is available from Radiation Safety Information Computational Centre at Oak Ridge National Laboratory as CCC545. ([www.cped.ornl /scale](http://www.cped.ornl.gov/scale)).
3. Duchemin, B.F., Nordborg, C., "Decay Heat Calculation- An international nuclear code comparison" NEA report NEACRP- 319 "L". www.nea.fr/html/science/docs/1989/neandc1989-275-u.pdf
4. Tobias A, "Decay Heat", Progress in Nuclear Energy, Vol.5, No. 1, pp.1-193 (1980).
5. Tobias A, "Derivation of Decay Heat Benchmarks for U235 and Pu239 by a Least Squares Fit to Measured Data", CEGB report RD/B/6210/R89 (1989).
6. Dickens J K, Love T A and McConnell J W, "Fission-Product Energy release for times following thermal-neutron fission of plutonium-239 and plutonium-241 between 2 and 14000 seconds", Nuclear Science and Engineering, Vol. 78, pp. 126-146 (1981).
7. Akiyama M et al, "Proceedings of a Conference on Nuclear Data for Basic and Applied Physics", Sante Fe, USA (1985).
8. Schmittroth F, "ORIGEN2 Calculations of PWR spent fuel decay heat compare with calorimeter data." HEDL-TME 83-32 UC-85
9. Rowlands J.L., Tubbs, N: "The Joint Evaluated File: A New Nuclear Data Library for Reactor Calculations", International Conference on Nuclear Data for Basic and Applied Science, Santa Fe, Paper IC3, May 1985.
10. OECD/NEA, "The JEF-2.2 Nuclear Data Library", JEFF Report 17, ISBN 92-64-17686-1. Available from the OECD Nuclear Energy Agency, Le Seine Saint-Germain, 12 Boulevard des îles, F-92130, Issy-les-Moulineaux, France.

Email: robert.w.mills@bnfl.com