

ANS Issues Clarification on ANSI/ANS-5.1-2005, Decay Heat Power in Light Water Reactors.

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Inquiry:

Could you provide an explanation of how the constants α_i and λ_i in the function $F(t,T)$ are determined? The λ_i appear to be decay constants but evidently are not. The α_i must be somehow related to fission product yield and decay energy.

Response:

The functional form of $F(t,T)$ is obtained by integrating the function $f(t)$ that describes the decay heat power following a single fission pulse. The α and λ coefficients are best understood by looking at the form of $f(t)$ as defined in the note for Tables 9-10 in Section 3.2 of ANSI/ANS-5.1-2005. The function $f(t)$ is fitted as a sum of exponentials such that the α and λ coefficients conservatively represent the experimental data over the range of measurements and calculated data for cooling times where no measurements exist. This functional form accurately represents the data and has a physical basis since fission product decay is predominantly exponential.

A detailed description of the experimental data used in developing the fit coefficients is provided in Appendix A of ANSI/ANS-5.1-2005. Additional information on the experimental data and development of the standard is described in an article by J. K. Dickens, T. R. England, and R. E. Schenter, "Current Status and Proposed Improvements to the ANSI/ANS-5.1 American National Standard for Decay Heat Power in Light Water Reactors," NUCLEAR SAFETY, Vol. 32, No. 2, 1991.