ANS Issues a Response to an Inquiry on ANSI/ANS-5.1-2005, "Decay Heat Power in Light Water Reactors."
(*Nuclear News*, June 2017)

Inquiry:

I have a question related to contribution of other actinides described in Eq. (26). The calculated value at 101 days after shutdown for cumulative burnup of 46.5 GWd/MTU and enrichment of 4.8% (eff 3.4%) (W 16x16 fuel) was around 3 kW and corresponding fission product (FP) decay heat was 13.1 kW. I have tried to calculate the same thing using ORIGEN 2.1 and ORIGEN-ARP from SCALE 6.1 package. Fission product decay heat was very similar, but contribution of all actinides was around 0.6 kW per fuel assembly. In any case, actinide power was around 5% of FP power in ORIGEN and around 20% in the ANS standard. The calculation procedure was checked on the example in Appendix A and was correct. This addition is new in ANSI/ANS-5.1-2014 (at least was not present in the 2005 version), and I would like to know if there are any comments by others on obtained contribution from other actinides. The calculation was performed to determine spent fuel heat load in the spent fuel pool. For longer cooling times the difference is less important. It is possible that I did something wrong, but it should be easy to check mentioned values?

Response:

The contribution from other actinides as defined in Eq. (26) is provided as a conservative option in the event that other values are not specified and justified by the user. As you note, this option was not provided in the previous version of the standard but was added to ensure that the user recognized the need to address other actinides when calculating total decay heat. Equation (26) yields conservative estimates, particularly in the time range between 106 and 108 seconds, due to treating complex actinide transmutation using a simple analytical expression. Note that Eq. (26) yields a similar estimate of this actinide component as ISO 10645-1992, "Nuclear Energy—Light Water Reactors—Calculation of the Decay Heat Power in Nuclear Fuels." In instances where the contribution of other actinides is relatively large (longer times) and the conservatism is also large, it may be preferable to replace this component using values developed for your specific spent fuel characteristics.