

Status of Burnup Credit for Spent Fuel Analysis and Certification in Transportation and Dry Storage -ABSTRACT

Even though there are provisions in NRC guidance for partial burnup credit, spent fuel assemblies have typically been analyzed for criticality safety, in storage, under 10 CFR Part 72, and in transportation, under 10 CFR Part 71, using a conservative fresh fuel assumption. This assumption has resulted in the design of spent fuel casks with smaller capacities and/or high boron-loaded neutron absorbers, to offset the additional reactivity provided by assuming fresh fuel. Crediting burnup of spent fuel in storage and transportation criticality analyses can increase the capacity of spent fuel casks, thereby reducing the overall costs associated with storage and transport, and potentially reducing the radiological risk associated with transport by reducing the overall number of shipments.

There is domestic and international recognition that the relative scarcity of experimental and validation data is the limiting factor for burnup credit. Improving the database of spent fuel isotopic-assay samples and critical experiments will promote a more straightforward, accurate assessment of the sub-critical margin and support clarity and efficiency in the preparation and review of the safety basis for expanded burnup credit. The Division of Spent Fuel Storage and Transportation (SFST) has been actively monitoring domestic and international efforts to obtain and develop additional radiochemical assay (RCA), laboratory critical experiment (LCE), and nuclear cross section data for the actinide and fission product isotopes that are most significant to spent fuel burnup credit analyses.

SFST has approved one spent fuel transportation cask system which uses burnup credit analyses to determine a fuel burnup versus enrichment loading curve. Three other proposals have been submitted to SFST for review. All four systems involve different approaches to crediting burnup, and all four have some differences from the current NRC guidance on spent fuel burnup credit. As more burnup credit data becomes available in the future, SFST expects to expand its burnup credit guidance in anticipation of an even greater number of spent fuel cask designs involving the use of burnup credit.