Regulatory Guidance

ISG-11, Rev. 3, Cladding Considerations for the Transportation and Storage of Spent Fuel

In order to assure integrity of the cladding material, the following criteria should be met:

1. For all fuel burnups (low and high), the maximum calculated fuel cladding temperature should not exceed 400^{0}C (752^{0}F) for normal conditions of storage and short-term loading operations (e.g., drying, backfilling with inert gas, and transfer of the cask to the storage pad).

   However, for low burnup fuel, a higher short-term temperature limit may be used, if the applicant can show by calculation that the best estimate cladding hoop stress is equal to or less than 90 MPa for the temperature limit proposed.

2. During loading operations, repeated thermal cycling (repeated heatup/cooldown cycles) may occur but should be limited to less than 10 cycles, with cladding temperature variations that are less than 65^{0}C (117^{0}F) each.

3. For off-normal and accident conditions, the maximum cladding temperature should not exceed 570^{0}C (1058^{0}F).

NRC Draft RIS 2015-XX Considerations in Licensing High Burnup Spent Fuel in Dry Storage & Transportation

Background

- The staff has also relied on guidance provided in ISG - 11, Revision 3, to review the expected behavior of HBF (assembly average burnup exceeding 45 gigawatt days per metric ton of uranium (GWd/MTU)) for up to 20 years in dry storage in the same manner as LBF….. Based on the data available at that time, it was also determined that these temperatures and stresses would prevent hydride reorientation from occurring. However, subsequent research has shown that hydrides may still reorient radially even if the temperatures and stresses indicated in ISG - 11, Revision 3, are not exceeded.

Guidance

- For transportation of uncanned HBF loaded directly from the spent fuel pool, an acceptable approach is to use guidance provided in ISG - 11, Revision 3, to determine the maximum cladding temperature, provide a justifiable ductile-to-brittle transition temperature, and to verify the minimum temperature remains above the ductile-to-brittle transition temperature for the entire duration of transportation. If these conditions are met, then the mechanical properties of the cladding material with circumferential hydrides may be used. If sections of the fuel cladding do not remain above the ductile-to-brittle transition temperature, additional steps would be necessary.

NRC Draft RIS 2015-XX: Roadmap