

REQUEST FOR ADDITIONAL INFORMATION

GLOBAL NUCLEAR FUEL – AMERICAS, LLC REQUEST FOR REVIEW OF MINIMUM MARGIN OF SUBCRITICALITY FOR USE UP TO 20 WEIGHT PERCENT URANIUM-235

By letter dated January 20, 2022 (Agencywide Documents Access and Management System Accession No. ML22020A129), Global Nuclear Fuel – Americas, LLC (GNF-A) requested U.S. Nuclear Regulatory Commission (NRC) approval to use its current nuclear criticality safety analytic methods, validation techniques, and minimum margin of subcriticality (MMS) described in NRC license SNM-1097, chapter 5, “Nuclear Criticality Safety,” for applications involving enrichments less than or equal to (\leq) 20 weight percent (wt.%) uranium-235 (U-235) in support of planned operations involving high assay low-enriched uranium (HALEU).

The following request for additional information is necessary to determine whether the licensee’s proposed MMS is acceptable and to facilitate the NRC staff’s review performed in accordance with NUREG-1520, “Standard Review Plan for Fuel Cycle Facilities License Applications,” and NUREG/CR-6698, “Guide for Validation of Nuclear Criticality Safety Calculational Methodology.”

RAI-NCS-1

Title 10 of the *Code of Federal Regulations* (10 CFR) 70.61(d) requires, in part, that the risk of nuclear criticality accidents be limited by assuring that under normal and credible abnormal conditions, all nuclear processes are subcritical, including use of an approved margin of subcriticality for safety (i.e., the MMS).

Section 5.3.B.4 of NUREG-1520, “Standard Review Plan for Fuel Cycle Facilities License Applications,” Revision 2, states that NRC staff reviews should include any relevant portions of the licensee’s criticality code validation report(s), as appropriate, in evaluating whether the licensee’s proposed MMS is acceptable. Section 5.3.B.4 also states that the reviewer should verify that calculations pertaining to changed operations are still within the licensee’s validated area(s) of applicability (AOAs), or that AOA(s) have been appropriately extended, and that the licensee’s proposed MMS remains valid.

In evaluating whether the licensee’s MMS remains valid, Appendix B to NUREG-1520 states that the reviewer should consider several aspects of criticality code validation before making a qualitative determination of the adequacy of the MMS, including: (1) the similarity of benchmark experiments to actual applications; (2) sufficiency of the data (including the quantity and quality of benchmark experiments); (3) adequacy of the validation methodology; and (4) conservatism in the calculation of bias and bias uncertainty.

Tables 5-2 and 5-6 of the SCALE 6.2.4 Validation Report, “Validation of SCALE 6.2.4/KENO-VI with the Continuous-Energy ENDF/B-VII.1 Cross Section Library for HALEU Systems,” provides a range of enrichments of \leq 37.76 weight percent (wt.%) and \leq 20.91 wt.% U-235 for the HALEU Homogeneous Systems and HALEU Heterogeneous Systems areas of applicability (AOAs), respectively. However, a validated version of SCALE, SCALE 6.1/KENO-VI, already covers enrichments up to 8 wt.% in its AOAs.

Enclosure

- a. State whether the SCALE 6.2.4 Validation Report is intended to replace, or simply supplement, the SCALE 6.1/KENO-VI Validation Report. Clarify which version of SCALE will be used for applications involving enrichments up to 8 wt.% U-235.
- b. Section 5.4.5.2 of the SNM-1097 License Application describes several analytical methods to perform nuclear criticality safety analyses (e.g., GEMER, GEKENO, MCNP, etc.). State the ranges of use for each analytical method described in Section 5.4.5.2 of the SNM-1097 License Application. Clarify which analytical methods will be used for applications involving enrichments greater than 5 wt.% U-235.