REQUEST FOR ADDITIONAL INFORMATION
Volume 2 – Preclosure
Chapter 2.1.1.7 - Design of Structures, Systems and Components Important to Safety and Safety Controls
Set 4 (RAI #1 - #8)

1. Justify that the benchmarks chosen apply to naval fuel in the repository and that the trending parameters sufficiently cover the effects which are significant to repository conditions.

2. Provide technical justification of the extension of the ATLF AOA parameter. Provide the results of goodness-of-fit tests for the observed linear regression as per NUREG/CR-6698, and comparison of the relevant parameters of the models to the benchmarks or results of TSUNAMI runs. Provide an explanation of the underlying physical phenomenon(a) causing different trending of k_{eff} on ATLF in mockup cores as compared to the ICSBEP experiments. Clarify that the ATLF is calculated and applied consistently for both Naval cores and benchmark experiments.

Basis: The applicant's validation of the codes and data set are documented in BEAR 10 Section 10.3. There is a statistically significant decreasing trend in dependence of k_{eff} on the ATLF parameter. The range of ATLF for repository conditions extends up to 1.0, beyond the ATLF of mockup cores. The applicant selected a set of ICSBEP experiments with ATLF extending up to 0.57 but did not justify the applicability of these experiments to the repository conditions as recommended by NUREG/CR-6698. The applicant observed significant trend with ATLF using mockup core data, then selected a set of ICSBEP with ATLF parameter range extending to 0.57 but did not observe a significant trend. The applicant concluded that since the codes showed "no-trend" for the ICSBEP experiments, it is acceptable to extend the AOA for ATLF to 1.0; which reflects repository conditions. The applicant extrapolated the trend in the Naval cores to 1.0 and used it as the value for Δk_{Trend}. This does not adequately justify the extension according to ANSI\ANS-8.1.

3. Justify that there are no compensating reactivity effects between different fission product isotopes or that any effect is adequately accounted for in the penalties for bias and uncertainty.

Basis: Figures 10.4.4.2.1-17 through 10.4.4.2.1-20 present comparisons of calculated and measured mass ratios of a prototype S8G element. For the location with the highest concentration of fission products the applicant's model predicts higher concentrations for 3 of the major fission products that the measured data points while predicting a lower concentration of Sm-149 that the measured data points. Therefore, the calculated reactivity may be compensated by these two opposite predicting trends. Nevertheless, Section 10.5.6 presents results of the sensitivity analyses of k_{eff} to isotopic variations where the concentrations of these 4 fission products were varied in concert, not separately. In addition, the measured concentrations of some fission products reach up to 100% uncertainty, but the concentration

was varied by 30%. These competing effects may potentially reduce bias associated with isotopic determination.

4. Justify that the DIG-ES* columns in Tables 10.5.5.3-1 and 10.5.5.4-1 are actually identical and that the removal of a Hafnium control rod has no effect on reactivity and Δk values.

5. Justify the 0.001 conditional probability of criticality assigned to the MC5 phenomenon, Localized Corrosion of Stainless Steel Type 316L. Provide the results of criticality analyses of configurations with degraded tie-rods and moderated by water with (i) plates tilted but not mislocated and (ii) plates shifted laterally. Provide information how the branch NCF-008 (Figure 9.5-1) and L-005 (Figure 9.3-1) probabilities were calculated and justify the calculations.

Basis: The applicant assumes that if water is present in the waste package, the threaded tie-rods undergo localized corrosion and degrade, causing the basket to lose structural support, but remnants of the rods would still impede formation of a closer packed array of assemblies. The applicant claims that a seismic event needs to coincide with localized corrosion, and an additional seismic event is needed to move plates laterally to disengage from degraded tie-rods. There are a large number of seismic events expected during postclosure. Since localized corrosion is a permanent process, it will coincide with the seismic events during the 10,000 year period. While most of these events will be small they may be able to separate degraded tie-rods from the plates leading to unanalyzed configurations.

6. Provide information to justify a) the data provided in Table 9.B-3, b) naval waste package misplacement probability in Section 9.B. 2.3.2, and c) the probability of drift collapse followed by subsequent water ingress.

Basis: The applicant relies of data from two DOE documents that are not docketed, and since this impacts the probability of criticality in the PSA, this information is needed.

7. Justify the probability of violating the restriction on placing two relatively hot waste packages next to each other in an emplacement drift (Section 9.3.2.2.2) used in the PSA.

8. Provide the calculations of the values for BEAR 14 Tables 1 and 2 which are documented in LS-DYNA Kinematic Damaged Area Analyses for the TAD bearing Waste Package, Rev. 0, dated February 27, 2007.