

Criticality/Shielding**CRITICALITY/SHIELDING RSI 1**

The staff issued an RSI requesting specification of the new contents, which includes failed fuel and damaged fuel, and information on how the failed fuel is confined in the fuel cell.

In response to the staff's RSI, the applicant referred to the definition of intact fuel in Table 2-3 and 2-4 from the Safety Analysis Report, Revision 0. The staff notes that the information in these referenced tables is inconsistent with the definition of failed fuel in the applicant's proposed Technical Specifications included with the submittal. Therefore, the staff cannot determine the characteristics of the new contents necessary to perform a criticality and shielding review of the cask design. Specifically, the allowable quantity of the contents per fuel cell and the physical form and the dimensions (i.e., rod segments, loose pellets) is needed. In order to determine the geometry and source distributions for the contents, the staff needs to understand how the content is confined in the fuel cell and the potential for fuel relocation/reconfiguration under normal and off-normal operations and accident conditions.

The staff needs this information to proceed with its review to determine if the NUHOMS® EOS system with the requested new contents meets the regulatory requirements of 10 CFR 72.124(a), 72.124(b), 10 CFR 72.236(c), and 10 CFR 72.236(d).

RESPONSE TO CRITICALITY/SHIELDING RSI 1:

Fuel may be categorized as intact, damaged, or failed. The potential for fuel reconfiguration for each of these fuel categories under normal, off-normal, and accident conditions has been added as new Updated Final Safety Analysis Report (UFSAR) Table 2-4a. The criticality, shielding, and thermal analyses consider fuel reconfiguration as appropriate, and damaged and failed fuel contents are limited considering reconfiguration.

All fuel categorized as failed shall be placed in a failed fuel canister (FFC). Accordingly, the definition of failed fuel in Section 1.1 of the Technical Specifications (TS) is revised to reflect this. Failed fuel may include fuel assemblies, fuel rods, segments of fuel rods, fuel pellets, and debris. As described in the response to Materials RSI 1, drawing sheets showing the FFC have been added to UFSAR Drawing EOS01-1010-SAR in Chapter 1. FFCs are not required for damaged fuel assemblies, as damaged fuel assemblies maintain their geometry under normal and off-normal conditions.

The pressurized water reactor (PWR) fuel assembly classes are summarized in UFSAR Table 2-2 and Table 2-4. The failed fuel content of each FFC is limited to the maximum metric tons of uranium (MTU) of an intact fuel assembly for each class. These limits are summarized in the TS as Table 2 and included in the UFSAR as new Table 2-4b to provide the maximum uranium loadings per FFC for failed PWR fuel. TS Section 2.1 is also revised to refer to TS Table 2 for maximum uranium loadings.

UFSAR Chapter 6 (Shielding Evaluation) and Chapter 7 (Criticality Evaluation) have also been revised to clearly indicate that no credit is taken for the FFC or any secondary containers. Reference made to the "RSB" (rod storage basket) has been deleted throughout the chapters because the "RSB" is simply an example of a type of secondary container, and no credit is taken for secondary containers.

Failed control components may also be stored inside an FFC. The maximum Co-60 content for failed control components is the same as intact control components and is defined in TS Table 3.

The characteristics of the spent fuel to be stored have also been updated in UFSAR Section 2.2 to reflect the changes in this response associated with failed fuel.

Application Impact:

TS Sections 1.1 and 2.1 are revised as described in the response. TS Table 2 is added as described in the response.

UFSAR Sections 2.2, 6.3.2, 7, 7.1, 7.2, 7.3.1, and 7.4 have been revised as described in the response.

UFSAR Tables 7-80, and 7-81 have been revised and Tables 2-4a and 2-4b have been added as described in the response.

UFSAR Figures 7-25 and 7-26 have been revised as described in the response.

Materials**MATERIALS RSI 1**

1. With respect to the use of the damaged/failed fuel basket end caps and rod storage baskets (or similar components) for the storage of failed fuel, provide the following information:
 - a. Clarify if the rod storage basket (or a similar component) performs any safety functions, such as confinement of gross fuel particles, debris, or damaged assemblies to a known volume within the dry shielded canister. Clarify how these components are relied on in the criticality, shielding, thermal, and structural evaluations, and in loading and retrievability operations.
 - b. Provide design bases information and drawings for the rod storage basket (or a similar component) if these components perform or support safety functions.
 - c. Provide an explanation of how the system meets the regulatory requirements of 10 CFR 72.236(h) and (m), and how the system is designed to allow the users to meet the regulatory requirements of 10 CFR 72.122(h)(1) if the rod storage basket (or a similar component) is categorized as not important to safety.
 - d. Clarify whether failed fuel would always be placed in a rod storage basket (or a similar component).

This information is necessary to determine compliance with 10 CFR 72.236(b), (h) and (m).

RESPONSE TO MATERIALS RSI 1:

A failed fuel canister (FFC) has been added to the design and shall be used to handle failed fuel, as described in the following response.

- a. The EOS-37PTH DSC is designed to accommodate up to eight damaged fuel assemblies (FAs) or up to four FFCs, with the balance intact FAs. The definition of failed fuel has been revised in Section 1.1 of the Technical Specifications. The design of the new EOS-37PTH FFC (shown in new sheets of revised Updated Final Safety Analysis Report (UFSAR) Drawing EOS01-1010-SAR) is similar to the FFCs already licensed for the 32PTH1 and 24PTH baskets, as discussed in Sections U.3.6.4 and P.3.6.4, respectively, of the CoC 1004 UFSAR. The FFC is protected by the fuel compartments and the only safety function is to confine the failed fuel (including particles and debris) to a known volume in the dry shielded canister. The FFC is not relied on in the criticality, shielding, thermal, or structural evaluations to perform a safety function. The FFC has slots on the upper portion of the liner to facilitate lifting and or unloading (and retrievability) of the FFC with the enclosed failed fuel contents, and a structural evaluation of the FFC, for lifting and handling, has been added to UFSAR Section 3.9.2.1A. UFSAR Chapter 9 has been revised to include operating procedures for the FFC, including handling during loading and unloading.
- b. The FFC geometry and the materials used for its fabrication are shown on a revision to UFSAR drawing EOS01-1010-SAR. A structural evaluation of the FFC is presented in UFSAR Section 3.9.2.1A.

- c. The FFC is categorized as important-to-safety. Each FFC is constructed of sheet metal, and provided with a welded bottom closure and a removable top closure. Consistent with 10 CFR 72.122(h)(1), this ensures that failed fuel is confined so that degradation of the fuel during storage will not pose operational safety problems with respect to its removal from storage. The FFC has slots on the upper portion of the liner to facilitate lifting and unloading (and retrievability) of the FFC with the enclosed failed fuel contents using normal fuel handling means, thus ensuring compliance with 10 CFR 72.236(h) and (m). The FFC is provided with screens at the bottom and top to contain the failed fuel and allow fill/drainage of water from the FFC during loading operations.
- d. Consistent with the revised definition of failed fuel in Section 1.1 of the Technical Specifications, failed fuel will always be loaded into an FFC.

Other conforming changes associated with the FFCs have also been made to UFSAR Chapters 2, 3, 4, 5 and 6.

Application Impact:

Technical Specifications Section 1.1 has been revised as described in the response.

UFSAR Sections 1.1, 1.2.1.1, 1.2.3.1, 1.4.1, 2.2, 2.4.2.1, 3.9.2.3A, 3.9.2.5, 4, 4.9.6.1, 4.9.6.2, 5.1, 6.1, 6.2.2, 9.1.1, 9.1.2 and 9.2.2 have been revised as described in the response.

UFSAR Section 3.9.2.1A has been added as described in the response.

UFSAR Tables 2-1 and 4.9.6-10 have been revised as described in the response.

UFSAR Figure 4.9.6-8 has been revised as described in the response.

UFSAR Drawing EOS01-1010-SAR has been revised as described in the response.