RAI Volume 3, Chapter 2.2.1.2.1, Fourth Set, Number 20, Supplemental Question:

Where in the response to RAI 3.2.2.1.2.1-4-020 did DOE consider, in its probability arguments for screening out criticality for DOE (excluding naval) and commercial spent nuclear fuel (SNF), the following:

a) Given the drip shield emplacement, quantify the volume of moderator required to reach criticality, the associated mechanisms that permit water accumulation, and the associated probability for SNF waste packages.

b) Quantify the number of waste packages estimated to contain the required volume of moderator that could lead to a criticality event.

1. SUPPLEMENTAL RESPONSE

Although the response to RAI 3.2.2.1.2.1-4-020 did not discuss the probability of moderation, the response to RAI 3.2.2.1.2.1-4-042 provides a discussion of in-package moderation. A discussion of how moderation is accounted for in the probability of criticality calculations is provided below as it pertains to the DOE SNF and commercial SNF waste forms.

(a) The DOE conservatively sets the probability of adequate moderation to support a critical event (given waste package breach) to 1.0 (SAR Section 2.2.1.4.1.1.2.2). DOE takes no credit for only partial filling of the waste package, possible drainage mechanisms, and the damaged drip shield protecting the waste package from advective water flow.

(b) The waste package design and loading strategy precludes criticality for fully flooded systems. Hence, the number of properly loaded waste packages that contain enough moderator to lead to criticality is zero as all are designed to remain subcritical even when fully flooded and degraded. However, the potential for criticality in the repository is conditional upon an initiating event that causes a breach of the waste package and a design nonconformance (e.g., fuel assembly misload) due to human error. The criticality feature, event, and process screening analysis accounts for uncertainty associated with the design and loading of waste packages as well as potential breach mechanisms, and establishes the integrated probability of one or more criticalities occurring in the repository for all DOE SNF and commercial SNF waste packages.

2. COMMITMENTS TO NRC

None.

3. DESCRIPTION OF PROPOSED LA CHANGE

None.

4. REFERENCES

None.

RAI Volume 3, Chapter 2.2.1.2.1, Fourth Set, Number 21, Supplemental Question:

> Clarify whether in response to RAI 3.2.2.1.2.1-4-021, the maximum burnup used for burnup credit for the pressurized water reactor (PWR) spent nuclear fuel (SNF) is 50 GWd/MTU. Provide a commitment to the maximum burnup that DOE will use for PWR SNF. If this extends beyond 50 GWd/MTU, provide additional applicable data to justify this.

1. SUPPLEMENTAL RESPONSE

When crediting the reduced reactivity potential of irradiated commercial pressurized water reactor fuel in criticality analyses, the maximum burnup that DOE will use is 50 GWd/MTU, unless additional validation data are provided to extend the burnup beyond 50 GWd/MTU. 50 GWd/MTU is the maximum burnup used in the fuel assembly misload evaluations for calculating the conditional probability of criticality given misload (SNL 2008, Section 6.4.2).

2. COMMITMENTS TO NRC

DOE commits to using a maximum burnup of 50 GWd/MTU with respect to the burnup credit loading curves in criticality analyses for commercial pressurized water reactor fuel unless additional validation data are provided to extend the burnup beyond 50 GWd/MTU.

3. DESCRIPTION OF PROPOSED LA CHANGE

None.

4. REFERENCES

SNL (Sandia National Laboratories) 2008. *CSNF Loading Curve Sensitivity Analysis*. ANL-EBS-NU-000010 REV 00. Las Vegas, Nevada: Sandia National Laboratories. ACC: DOC.20080211.0001.