## HLWYM HEmails

**From:** James Andersen
**Sent:** Thursday, June 27, 2002 12:16 PM
**To:** David Pickett; Oleg Povetko; Dennis Galvin; Michael Markley; Meraj Rahimi; King Stablein; Tamara Bloomer; Tae Ahn
**Cc:** James Firth; Timothy McCartin
**Subject:** Telecon on Criticality
**Attachments:** Criticality Additional-Qs.wpd

The call with DOE on criticality is scheduled for 1:00pm (ET) today. I just received the bridge number, it is 702-295-9038. For NRC participants, we will meet in room T-7C1.

The additional questions we sent DOE yesterday are attached.

Jim A.

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**From:** James Andersen

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## Additional Question on Postclosure Criticality Methodology Topical Report

### Waste Package Juvenile Failure

1. PRODIGAL calculations from an ASME Conference paper ("Flaw Size Distribution and Flaw Existence Frequencies in Nuclear Piping," Khaleel, Chapman, Harris and Simonen, pp 127-144, August 1999) were used to estimate fabrication flaws in the closure weld of the waste package. Discuss the technical basis for each of the following:

- The potential for different cracking mechanisms in Alloy 22 and at different probabilities of occurrence than for stainless steel or ferritic steel.
- The effect(s) of embedded flaws.
- The effect(s) of the weldability of Alloy 22 vs. stainless steel or ferritic steel.
- The potential for cracking in the HAZ.

2. Discuss the technical basis for the assumption that "all flaws detected by post-weld inspections are perfectly repaired."

3. Discuss the technical basis for the exclusion of all welds other than the closure weld from the analysis.

4. Discuss the technical basis for the effects and effectiveness of the processes to relieve residual stresses from the welds.

### Neutronics

1. Describe the methodology in determining a value for the Critical Limit margin in Figure 3-3.

   a. DOE has stated in Section 3.5.1.2, 2nd paragraph, "a $k_{eff}$ margin is subtracted for the CL to provide assurance that the configuration classes or configurations within a class are not prematurely omitted from further evaluation. Specific values for this margin will be established as part of the criticality model validation ...." DOE needs to discuss its methodology in setting a value for this margin.

2. Discuss the list of the parameters which will be used in the $k_{eff}$ regression equations.

3. Discuss the isotopic and criticality modeling for DOE-owned SNF and plutonium-bearing high-level glass logs.

4. Sec. 3.7. First paragraph. It is assured referring to Figure 3-1, that when keff resulting from the degradation of a waste package design exceeds the CL, the consequences of the resulting criticality will be estimated. In revised Figure 3-1 (presented as Preliminary Predecisional Draft Material) this estimate of the criticality event consequences is not assured anymore, the consequence analysis will be performed only if 10CFR63 Probability Criterion is not satisfied. Clarify when the consequences of the resulting criticality event will be estimated.

5. Sec.3.7.1. First paragraph. Clarify that “incremental increase in the radionuclide inventory accessible for transport to the external environment” as a principal consequence of the criticality event will include potential change in the source term (additional short-lived radionuclides) for a receptor dose calculations. For a criticality event in the alluvium in the saturated zone, short-lived fission products that transport rapidly to the location of the receptor could be formed before they decay to stable nuclides, which could lead to larger doses than the doses from the long-lived radionuclides that are considered significant under nominal conditions.

6. Sec.3.7.1.1 Page 3-74. First paragraph

> Bullet 1) Clarify if other mechanisms of accumulation of fission materials would be considered. For instance, one of the potential mechanisms of accumulation of plutonium is through absorption of plutonium colloids on stainless steel parts and consequent release of this material due to mechanical shock.
>
> Bullet 2) Discuss the technical basis for a 1/1000 second requirement for a neutron density doubling time in order to cause the movement of the material.

7. Sec.3.7.2. Page 3-77. First paragraph. Discuss the reactivity insertion rates quantitatively that distinguish 2 regimes that are discussed in this paragraph, high power pulse with short duration and cumulative buildup of radionuclide increments over a periodic pulsing. It’s not clear what is the principal difference between these 2 regimes and why “power pulse” cannot repeat over and over again which would lead to the “cumulative buildup of radionuclide increments”.

8. Sec.3.8.1. First paragraph. If the risk associated with repository criticality will be calculated as “ the product of the probability of criticality occurrence multiplied by the criticality consequences and summed over all credible criticality event categories (or probability-consequence pairs)” and if Consequence Analysis will not be performed for criticality configurations based on 10CFR63 Probability Criterion allowance, then how will the risk be truncated or redefined? Will the risk ( dose to the receptor) be estimated for “low probability/high consequences” events such as far-field criticality event in the saturated zone in close proximity to the receptor water well location?