HLWYM HEmails

From: Oleg Povetko
Sent: Monday, December 15, 2003 7:08 PM
To: Dennis Galvin
Subject: CGM report review by CLST KTI
Attachments: CGM_reviewCriticality_CLST_Chiang 121503.wpd

Dennis:

Attached is a file with results of CLST KTI review of corresponding portions of CGM for In-Package Criticality Report conducted by Kuan Sang Ken-Chiang.

Oleg.

Hearing Identifier: HLW_YuccaMountain_Hold_EX
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Subject: CGM report review by CLST KTI
Sent Date: 12/15/2003 7:07:59 PM
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Recipients:
"Dennis Galvin" <Dennis.Galvin@nrc.gov>
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Files	**Size**	**Date & Time**
MESSAGE	174	12/15/2003 7:07:00 PM
CGM_reviewCriticality_CLST_Chiang 121503.wpd		16301

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Priority: Standard
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CLST

6.6.1.3-6.6.1.9 pages 52-54, multiple sections

6.6.1.3 Water Accumulation in the Waste Package
Agree with assumption.

6.6.1.4 Corrosion Rate of Neutronit A978
It is assumed that the corrosion rate of Neutronit A978 is 2.5 times the rate of Stainless Steel Type 316. The data for stainless steel corrosion rate is taken from DTN: MO0303SPAMCRAQ.000. In Attachment VI, only 13 data points for corrosion rate of Stainless Steel 316 were given. This Stainless Steel Type 316 data does not consider the uncertainties in environmental variables such as chloride concentration, temperature, PH level, among other factors relevant to the repository. The uncertainties in Stainless Steel Type 316 data will propagate into Neutronit A978 data. Therefore the applicability of corrosion rate of Neutronit A978 data needs to be further evaluated.

6.6.1.5 Ingress of Water Into Waste Packages
Agree with assumption.

6.6.1.6 Creation of an Advective Pathway
Agree with assumption.

6.6.1.7 First Breaches of the Drip Shield
Agree with assumption.

6.6.1.8 Gaps Between Drips Shields
Agree with assumption.

6.6.1.9 Size of Gap Created by Stress Corrosion Cracking
Agree with assumption.

6.6.8 pages 72-73, Waste Package Internal Structure and Waste Form Degradation
The carbon steel 516 data was used in CGM. Carbon steel 516 corrosion rate was obtained from: DTN: MO0303SPAMCRAQ.000 in Attachment VI. In Attachment VI, 24 data points on corrosion rate of Carbon Steel Type 516 were given. The conditions under which the corrosion rates were obtained is not clear. The corrosion rates is highly dependent on chemical composition of the liquid environment and metallurgical conditions of the materials after fabrication, and temperature. More information on the conditions of Carbon Steel 516 data is needed.

6.6.9 pages 73-74, Waste Form Degrade in Place
Agree.

6.6.10 pages 74-78, Waste Form Degrade in Place
The carbon steel 516 data in Attachment VI was used in CGM. Carbon steel 516

corrosion rate was obtained from: DTN: MO0303SPAMCRAQ.000. The corrosion rate of Carbon Steel A516 was fitted into a lognormal d distribution. As discussed in 6.6.8, the conditions under which the corrosion rates were obtained is not clear. The uncertainties in corrosion rate data will propagate into the lognormal distribution.
The internal structure of certain waste packages is designed to be partly constructed of Stainless Steel Type 304. The carbon steel 516 data in Attachment VI was used in CGM. Carbon steel 516 corrosion rate was obtained from: DTN: MO0303SPAMCRAQ.000. In Attachment VI, 43 data points for Stainless Steel Type 304. However, the conditions under which the corrosion rates were obtained is not clear. As discussed before, the corrosion rates is highly dependent on chemical composition of the liquid environment and metallurgical conditions of the materials after fabrication, and temperature. More information on the conditions of type 304 stainless steel corrosion rate data is needed. The uncertainties in corrosion rates of 304 stainless steel will propagate into the lognormal distribution used for analysis.

The uncertainties in corrosion rate data of Carbon Steel Type 516 and Stainless Steel Type 304 will propagate into analysis in Section 6.6.10.1 Waste Package Basket Structure Degradation. The uncertainties in corrosion rate data of Stainless Steel Type 316 will propagate into analysis in The Section 6.6.10.2, Waste Package Absorber Plate Degradation because the corrosion rate of Neutronit A978 data was derived from those of Stainless Steel Type 316.

6.6.13 to 6.6.20, page 79-83, multiple sections.
The uncertainties in corrosion rate data of Stainless Steel Type 316 will propagate into analysis in The Section 6.6.13, Soluable Absorber Flushed from Waste Package because the corrosion rate of Neutronit A978 data was derived from those of Stainless Steel Type 316.

6.6. 21 page 83-86, Disruptive Events.
Section 6.6.21.2, the effect of seismic activities on the integrity of waste package component should be analyzed.

6.7.1 page 86-89, Waste Form Degrades - Mobilizing Fissionable Materials
Attachment VII

Table VII-2, the source of minimum, mean and maximum of the peak waste package temperature was CRWMS M&O 2001b. The data should be updated to include recent waste package surface temperature data from " Fedor R., G. Adams, C. Manepally, and S. Green, 2003 Thermal Conductivity, Edge Cooling, and Drift Degradation-Abstracted Model Sensitivity Analysis for Yucca Mountain. CNWRA"

It is agreed the Zircaloy cladding has a high corrosion resistance. The analysis considered creep strain failure and stress corrosion cracking. But because the cladding is thin, the possibility of mechanical damage should also be analyzed if the outer waste package barrier is damaged.

6.7.2.6.2, page 100-102, Top Event MS-IC-2 Probability (Drip Shield Failure).

The recent model developed by Goodluck Ofoegbu and Doug Gute should be considered for rockfall scenario model. More detailed analysis may be obtained from G. Ofoegbu and D. Gute.

6.7.2.6.3, page 103-105, Top Event MS-IC-3 Probability (Waste Package Failure).

In section 6.7.2.6.3, sensitivity analysis was performed of an early waste package failure due to improper heat treatment. However, the effect of welding methods, annealing time and temperature, aging time and temperature, and post welding operations and procedures used in closure, should also be included in the analysis. .

6.7.2.6.4, page 105-107, Top Event MS-IC-4 Probability (Bathtub Probability).

In section 6.7.2.6.4, two advective flow paths into the waste package have been discussed, they are improper heat treatment and general corrosion. The analysis of general corrosion rates have not adequately evaluated the effect of water chemistry, relative humidity and temperature; and fabrication and closure processes and operation.

6.7.2.6.8 page 107-108, Top Event MS-IC-19 Probability (Borated Steel Failure).

Top event MS-IC-19 represents the corrosion rate of Neutronit. Here again, the probability calculation uses the corrosion rate probability density function discussed in Subsection 6.6.10. Because the corrosion rate of Neutronit was derived from Stainless Steel Type 316 in 6.6.1.4, the uncertainty in Stainless Steel Type 316 data will be propagating into the analysis of corrosion rate analysis of Neutronit.