HLWYM HEmails

From: Oleg Povetko
Sent: Monday, December 15, 2003 7:13 PM
To: Dennis Galvin
Subject: review of TR REV 02 - Consequences
Attachments: review of SER Rev 0 open itemsPOVETKO121203.wpd

Dennis:

Attached are results of my short review of assigned portions of TR Rev 02.

Oleg.

Hearing Identifier: HLW_YuccaMountain_Hold_EX
Email Number: 1833

Mail Envelope Properties (opovetko@cnwra.swri.edu20031215191200)

Subject: review of TR REV 02 - Consequences
Sent Date: 12/15/2003 7:12:57 PM
Received Date: 12/15/2003 7:12:00 PM
From: Oleg Povetko

Created By: opovetko@cnwra.swri.edu

Recipients:
"Dennis Galvin" <Dennis.Galvin@nrc.gov>
Tracking Status: None

Post Office:

Files	**Size**	**Date & Time**
MESSAGE	96	12/15/2003 7:12:00 PM
review of SER Rev 0 open items	POVETKO121203.wpd	21950

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Table of Open Items from SER

Open Item	Open Item Addressed (yes/no?)	Section of TR Rev. 2	Comment
1) The staff believes that burnups of spent fuel assemblies must be verified through measurements before their loading into the WP for the purpose of burnup credit verification.			
2) The consequence criteria for transient and external criticalities are not addressed in the TR. The DOE must specify if it intends to perform full consequence analyses for transient and external criticality events and include them in TSPA or use some type of criteria for the purpose of criticality control design selection.			
3) The DOE needs to provide a modeling approach for igneous-activity-induced criticality;	no	3.3.4	While there is a section 3.3.4, “Effect of Volcanic Events,” little additional information is provided beyond what was already discussed in the SER and no references are identified. Therefore DOE has not addressed the open item.
4) The DOE must include the effects of radionuclide migration from an intact fuel assembly though pin-holes and cracks in the cladding.			
5) The DOE must include a criticality margin when comparing keff values from regression analyses to CL values.			

Open Item	Open Item Addressed (yes/no?)	Section of TR Rev. 2	Comment
6) The DOE must present an approach for developing the criticality margin.			
7) The DOE must demonstrate the adequacy of using one-dimensional calculations to capture three-dimensional neutron spectrum effect in their point-depletion calculation or use two/three dimensional calculations for determining the neutron spectra during the depletion cycles to be used in the depletion analyses.			
8) The DOE needs to use the cross-section data corresponding to the temperature for the WP or critical benchmarks.			
9) The DOE must include the cross-dependency of configuration parameters for keff regression equations.			
10) The DOE must provide the technical basis for the correction factors developed for boron remaining in the solution.			
11) The DOE is required to develop an acceptable methodology for establishing bias and uncertainties for the isotopic depletion model.			
12) The DOE needs to establish the bias and associated uncertainty regarding the analysis or model, keeping track of the isotopic inventory loss, through cracks or pin-holes, within intact spent fuel assemblies.			

Open Item	Open Item Addressed (yes/no?)	Section of TR Rev. 2	Comment
13) The DOE should address the types of criticality uncertainties and biases, which is based on ANSI/ANS-8.17, presented by the staff in this SER.			
14) The DOE must include a multi-parameter approach in its bias-trending analysis.			
15) The DOE is required to include the isotopic bias and uncertainties as part of kc, if not included as isotopic correction factors.			
16) The DOE must present a validation methodology or work scope for external criticality models.			
17) The DOE should subject the method used for extending the trend to the procedures defined in ANSI/ANS-8.1-1998, C4(a) and C4(b).			
18) The DOE must verify and validate the regression equation or look-up table for all ranges of configuration and WF parameters affecting keff.			
19) The DOE is required to include all uncertainties and variabilities introduced by the regression equation or the look-up table.			

Open Item	Open Item Addressed (yes/no?)	Section of TR Rev. 2	Comment
20) In developing the methodology for steady-state criticality consequences, the DOE must consider other types of moderators, especially with respect to external criticality.	Yes, partially	3.7.1.1,	1. Only silica and naturally-occurring carbon are acknowledged as additional moderator materials. Carbon contained in SNF is not considered. 2. The statement on moderator efficiency in 3.7.1.1 requires clarification. The efficiency of a substance in slowing down neutrons without excessive absorption is given by the moderating ratio, the ratio of the slowing-down power to the absorption cross section. This value is higher for carbon than it is for water, 216 vs 62 according to (Glasstone, 1980). For large systems, moderators with a high value for moderating ratio are preferred.
21) The DOE must also consider the loss of soluble neutron-absorbing isotopes through pin holes and cracks in the spent fuel cladding, and its effect on steady-state criticality consequence.	Yes, partially	3.7.2.1	The issue is acknowledged, but no modeling approach is presented.

Open Item	Open Item Addressed (yes/no?)	Section of TR Rev. 2	Comment
22) The DOE must also include other types of steady-state criticality consequences, especially with respect to internal criticality, in its consequence analysis approach.	No	3.7.2.1	1. The exclusion of shorter half-life RNs from criticality consequences analyses is qualitatively explained by the fact that they will decay away before they can reach biosphere with the reference to TSPA calculations. This exclusion is not acceptable since only 16 RNs are considered in TSPA-SR nominal 10,000-yr scenario and there is a several thousand year period on average in TSPA calculations before WP is breached and RNs reach biosphere and the rate of production of additional shorter half-life radionuclides is low, while in case of criticality event, WP is already breached and RNs are available for release at the offset of the event. There is also a continuous production of new fission products, with longer and shorter half-lives, as

Open Item	Open Item Addressed (yes/no?)	Section of TR Rev. 2	Comment
			an output of the steady-state criticality event.
			2. The degradation rates of WP materials will increase significantly as a result of criticality event, not slightly. The statement on insensitivity of Alloy 22 corrosion rates to temperature is based on the results of mass loss experiments that are not considered representative for the temperature sensitivity analyses. The results of electrochemical experiments show a temperature sensitivity of corrosion rates. 3. Effects of radiolysis (including radiolytic decomposition of water) are not considered.
23) The DOE needs to develop, and present for acceptance, the modeling approach for an external steady-state criticality consequence.	Yes, partially	3.7.2.3	Only incremental increase of RN inventory is considered as a consequence.

Open Item	Open Item Addressed (yes/no?)	Section of TR Rev. 2	Comment
24) The DOE must develop and present a request for approval of a methodology for transient criticality consequence.	Yes	3.7.2.2	Results of analyses in (BSC, 2001,p.39) show that higher fuel temperature results in greater reactivity. It contradicts the statement on negative reactivity feedback mechanism caused by Doppler broadening of absorption CSs.
25) The DOE needs to develop and present, for NRC acceptance, the modeling approach for transient criticality consequence.	yes	3.7.2.4	
26) The DOE needs to develop a validation approach for the power model for steady-state criticality consequences.	No		
27) The DOE must develop a validation approach for a transient criticality consequence model.	yes	3.7.3.2	It's not clear how the non-conservative bias identified during validation process will be included in the consequence calculations
28) The DOE should describe the interface between Figure 1-1 of the RAI responses and the TSPA criticality risk analysis.	Yes, partially	3.8.1	The interface between Fig. 3-1 and the TSPA analyses is described. It's not clear how additional shorter half-life radionuclides (if any are identified as a result of criticality consequences analyses) will be incorporated into TSPA analyses.

BSC (Bechtel SAIC Company, LLC.) 2001. PWR Depletion Parameter Sensitivity Evaluation. CAL-UDC-NU-000009 REV 00. Las Vegas, Nevada: Bechtel SAIC Company. ACC: MOL.20011019.0179.

Glasstone, S. and A. Sesonske. Nuclear Reactor Engineering. New York City, New York: Van Nostrand Reinhold Company. 1981