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TRANSNUCLEAR WEST

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Mr. Steven Baggett
Project Manager, Spent Fuel Project Office
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

Subject: Response to NRC Staff's Verbal Request for Addition of BPRA Source Term Definition to the Preliminary CoC (Reference 1)

Reference: Revision 1 of Application for Amendment No. 3 to the NUHOMS® Certificate of Compliance No. 1004, Submitted November 29, 1999 (TAC No. L22954)

Dear Mr. Baggett:

Transnuclear West Inc. (TN West) herewith submits its response to the staff's verbal request for the addition of BPRA source term definition to the Preliminary CoC (Reference 1). TN West's suggested definition and a supporting justification are included as an Attachment to this letter. Also included is a revised version of Table 1-2c (Page B.8 of Attachment B of the Application) to reflect the BPRA source term definition.

Please contact Mr. U. B. Chopra (510-744-6053) or me (510-744-6020) if you require any additional information in support of this submittal.

Sincerely,

Robert M. Grenier

Robert M. Grenier
President and Chief Operating Officer

Attachments: As stated

cc: File NUH003.12004

Transnuclear West Inc.
39300 Civic Center Drive, Suite 280, Fremont, CA 94538
Phone: 510-795-9800 ◆ Fax: 510-744-6002

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Item 1:NRC Proposed Wording for Definition of BPRA Source Term:

"The source term from the BPRA component cannot exceed that source term on a BPRA burned with fuel specification of 36,000 MWd/MTU and 3.3% enrichment, as evaluated in Appendix J of the SAR."

TNW Response:

TNW is in general agreement with the proposed approach, however would like to remove the reference to 3.3 wt% enrichment. TNW proposes that the following wording be used instead:

"BPRA burnup cannot exceed that of a BPRA irradiated in fuel assemblies with a total burnup of 36,000 MWd/MTU."

The definition of the BPRA source term suggested above has been added to Table 1-2c of the Application (Attachment B, page B.8).

Justification for removing the enrichment requirement:

Available data presented in "Spent Nuclear Fuel Discharges from U.S. Reactors 1993," SR/CNEAF/95-01, February 1995 indicates that for fuel assemblies discharged with burnups greater than 45,000 MWd/MTU that:

- 99.1% of the assemblies discharged as of 1993 had initial enrichments above 3.4 wt%,
- 96.5% of the assemblies discharged as of 1993 with burnups in excess of 45,000 MWd/MTU had initial enrichments above 3.4 wt% , and
- The average enrichment for assemblies with burnups between 45,000 and 50,000 MWd/MTU is 3.8 wt%.

TN West notes that the total burnup is defined as the sum of the assembly average burnups of the specific assemblies and cycles in which a given BPRA was inserted.

Examples of the total burnup definition include:

1. If a BPRA were inserted in an assembly for one cycle, the total burnup is the assembly average burnup that the assembly experienced during that one cycle.

2. If a BPRA were inserted in Assembly A for the first cycle and in Assembly B for the second cycle, the total burnup is the sum of the Assembly A burnup experienced for the cycle with the BPRA inserted plus the Assembly B burnup experienced for the cycle with the BPRA.

BPRA components are irradiated for a maximum of two cycles. Fuel assemblies that attain a burnup of 36,000 MWd/MTU after the first two cycles of operation will attain a total burnup in excess of 45,000 MWd/MTU after the third cycle of operation. Therefore, for most BPRAs, the initial enrichment assumption is conservative but not bounding. However, it should also be noted that very few BPRAs are used for more than one cycle of operation. The number of BPRAs used for more than one cycle is considerably less than 24 in any one cycle. This makes loading 24 BPRAs in a single DSC with maximum burnup and minimum cooling time impossible.

The dose rate contribution outside the Cask/HSM is due primarily to the Co60 content and distribution. Therefore, the increase or decrease in the dose rate due to the BPRA is equal to the increase or decrease in the Co60 content. TNW performed a sensitivity analysis to determine the effect on dose rate of reducing the initial enrichment from 3.3 wt% to 2.8 wt%. The sensitivity analysis included the two source term models described in TNW calculation NUH004.0521, Revision 0. The Co60 content increased by approximately 10% in both cases. Since the BPRA contribution to the total dose rate on the surfaces of the HSM and Transfer Cask is about 14%, the maximum increase in dose rates is less than 1.5% for this case.

In summary, TNW believes that it is sufficient to only specify the maximum BPRA burnup history to assure that dose rates will be within their limits because:

1. Radiation source terms assumed for the BPRAs conservatively consider all 24 BPRAs burned for two cycles. Actual plant operation reflect approximately 20% of BPRAs burned for more than one cycle.

2. There are so few assemblies with burnups greater than 45,000 MWd/MTU and enrichments less than 3.3 wt%,

3. Enrichments less than 3.3 wt% have such a minor effect on the dose rate contribution of BPRAs, and

4. Confirmatory measurements are made for each DSC transfer operation and each DSC loaded into a HSM to assure compliance with the applicable Technical Specifications.

Item 2: Explanation for why the BPRA analysis assumes a DSC filled with water and no inner top cover plate while the SAR analysis assumes that the water is drained 6" below the bottom of the shield plug and the inner top cover plate installed:

The current NUHOMS® license (CoC No72-1004) Technical Specification 1.2.6 requires the dose rate on top of the shield plug to be less than 200 mR/hr. The SAR analysis that most closely matches this condition is the case with a 6-inch gap between the top of the water inside the DSC and the bottom of the shield plug with the inner top cover plate installed. TNW has traditionally analyzed this condition by modeling this 6-inch air gap inside the DSC.

For ALARA purposes, the welding machine is physically attached to the inner top cover plate prior to the inner top cover plate being placed on the DSC. This configuration makes it difficult to measure the dose rate on the inner top cover plate. TNW, in our original amendment application, proposed changing the wording in the Technical Specification to allow the dose rate measurement to be performed with the cavity full, but without the inner top cover plate in place. This was considered reasonable because the measured dose rate is dominated by the gamma dose rate, and 6-inches of water provides essentially equivalent shielding of the 0.75-inch steel inner top cover. TNW analyzed this configuration with the inner top cover plate removed in support of the proposed technical specification changes that were required because of the BPRA contribution for this condition.

Table 1-2c

PWR Fuel Qualification Table for the Standardized NUHOMS®-24P DSC (Fuel With BPRAs)

(Minimum required years of cooling time after reactor core discharge)

Burnup (GWd/ MTU)	Initial Enrichment (w/o U-235)																				
	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0
10																					
15	5	5																			
20	5	5	5	5	5																
25		5	5	5	5	5	5	5	5												
28				5	5	5	5	5	5	5	5	5									
30						6	6	6	5	5	5	5	5								
32							6	6	6	6	6	6	5	5	5						
34								7	6	6	6	6	6	6	6	6	6				
36									8	7	7	7	6	6	6	6	6	6	6		
38											8	8	7	7	7	7	6	6	6	6	6
40												9	9	8	8	8	7	7	7	7	6
41												10	9	9	9	9	8	8	8	8	8
42													10	10	9	9	9	9	9	9	9
43													11	11	11	10	10	10	10	9	9
44														12	11	11	11	11	10	10	10
45														13	12	12	12	11	11	11	11

Not Acceptable per Figure 1.1

Not Acceptable or Not Analyzed

Notes:

- *BPRA Burnup shall not exceed that of a BPRA irradiated in fuel assemblies with a total burnup of 36,000 MWd/MTU.*
- *Minimum cooling time for a BPRA is 5 years for B&W designs and 10 years for Westinghouse designs, regardless of the required assembly cooling time.*
- *Use burnup and enrichment to lookup minimum fuel assembly cooling time in years. Licensee is responsible for ensuring that uncertainties in fuel enrichment and burnup are correctly accounted for during fuel qualification.*
- *Round burnup UP to next higher entry, round enrichments DOWN to next lower entry.*
- *Fuel with an initial enrichment less than 2.0 w/o U-235 must be qualified for storage using the alternate nuclear parameters specified in Table 1-1a. Fuel with an initial enrichment greater than 4.0 w/o U-235 is unacceptable for storage.*
- *Fuel with a burnup greater than 45 GWd/MTU is unacceptable for storage. Fuel with a burnup less than 15 GWd/MTU must be qualified for storage using the alternate nuclear parameters specified in Table 1-1a.*
- *Example: An assembly with an initial enrichment of 3.65 w/o U-235 and a burnup of 42.5 GWd/MTU is acceptable for storage after a ten-year cooling time as defined at the intersection of 3.6 w/o U-235 (rounding down) and 43 GWd/MTU (rounding up) on the qualification table.*