From: Thomas Alexion
To: MILLAR, DANA
Date: 7/14/03 4:50PM
Subject: SFP RAI

Dana,

See the attached.

Tom

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Request for Additional Information - Reactor Systems Branch
Amendment Request to Revise Spent Fuel Pool Loading Pattern
Arkansas Nuclear One, Unit 2

1. The licensee's amendment identifies Combustion Engineering (CE) 16 x 16 spent and fresh fuel assemblies as the fuel types stored in the spent fuel pool and, therefore, used in the criticality analysis. The staff requests the licensee to specify if any other fuel types are currently stored in the ANO-2 spent fuel pool. If additional fuel types are stored in the pool, the staff request the licensee to demonstrate quantitatively that the CE 16x16 assemblies provide the most conservative criticality analyses.

2. Attachment 1 of the June 30, 2003, application references two types of CEAs inserted in fresh and spent fuel assemblies. Are there differences in reactivity worth between the two types of CEAs? If so, was this difference accounted for in the criticality calculation of the pertinent assemblies?

3. The current configuration of the spent fuel pool at ANO-2 is a two region configuration. It is not clear if this configuration has been retained for this proposed change to the ANO-2 Technical Specifications. Please provide additional clarification.

4. The application also proposed that the boron concentration in the spent fuel pool be increased to 2000 ppm. Is this the same value as in the boron storage tank?

5. The subject of "bounding polynomials" was raised in Attachment 1 and in the Holtec report. However, no basis was provided for the number of terms included or the obtained values of the coefficients. Please provide the technical justification and an example of how one of the polynomials is developed.

6. Figure 3.9.2 on page 3/4 9-17 indicates a dashed vertical line between Pattern 1 and the remaining four patterns. Please explain the presence of the dashed line in this figure.

7. On page 7 of the Holtec report, bullet no. 6 in the list of assumptions makes reference to assumed "conservative operating conditions." Please provide clarification of these conditions.

8. Also on page 7, bullet no. 7 makes reference to "absorber rods" being treated as fuel rods in the criticality analysis. Are absorber rods the same thing as CEAs? If so, what U-235 enrichment was assigned to these rods?

9. It is not clear to the staff (from reading the application) what roll the CEAs played in meeting and maintaining the subcriticality requirements of 10 CFR 50.68 or any other regulatory requirement(s).

   a. Please provide references to applicable codes, standards, and regulatory requirements, permitting the use of CEAs as neutron absorbing material in spent fuel pool criticality calculations. (Be specific as to which document, section, etc., is being referenced.)

   b. It is stated in Table 1.1, that CEAs were used in 4 of the 9 rankings. Besides the obvious effect of the presence of the CEAs in the chosen assemblies (i.e.,

suppressing the reactivity in that assembly), were the criticality requirements of 10 CFR 50.68 met with or without the presence of these CEAs in the assemblies?

c. If the CEAs were included in the criticality calculations, please provide qualitative and quantitative technical information as to how the CEAs were accounted for in Monte Carlo N-Particle Transport Code MCNP and any other calculational method used to meet the regulatory requirements.

10. The licensee provided tables showing the minimum burnup required for storage of spent fuel assemblies in each of the racks as a function of cooling time and average fuel enrichment. The staff requests the licensee specify if the table values and the figures generated from them assumed the uncertainty in the fuel enrichment. That is, for an enrichment of 4.95 weight percent, was the uncertainty (± 0.05 weight percent) considered in the burnup and cooling-times calculations?

11. On page 10 of the Holtec report, section 4.2, 3rd paragraph, a discussion is presented regarding the determination of the uncertainties associated with the depletion process. This paragraph needs expanding. Please provide clarification as to what is meant by "Conservatively bounding moderator and fuel temperature" and "upon other considerations." Also, it is not clear to the staff what is being conveyed by the second to the last sentence in the same paragraph. Please provide additional clarification of each step presented in this paragraph.

12. Page 12 of the Holtec report, Section 5.1, nominal design case, describes the determination of K-eff unborated. Did these calculations include assemblies with CEAs inserted in them? Please clarify. (This question ties in with question 10.)

13. The licensee's criticality analysis has identified the mis-loading of a fresh fuel assembly into a Region 2 cell intended to remain empty, as an event which requires 825 ppm of soluble boron to assure the maximum k_{eff} does not exceed 0.95.

a. It is not clear to the staff why reference is made to Region 2 when reference to either Region 1 or 2 is deleted in the TS-requested changes in Attachment 2.

b. Here again no reference is made as to what roll the CEAs played in the analysis. That is, did the misloaded assembly have a CEA inserted in it? Please clarify.

c. Was the accidental removal of a CEA from an assembly requiring it to be inserted in it, analyzed as a possible accident? If not, please provide technical justification as to why this scenario should not be considered as another accident.

14. In reviewing Table 2.1, page 20 of the Holtec report, the staff identified differences in values such as 0.0097 and 0.0129 for the manufacturing tolerance uncertainty, 0.0092 and 0.0101for temperature effects, depletion effects, etc., between the analyses for each of the 5 patterns. Please provide clarification and justification for the differences.