November 6, 2008

Mr. Richard D. Montgomery
AREVA NP, Inc.
3315 Old Forest Road
Lynchburg, VA 24506

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR REVIEW OF THE MODEL NO. SP-1/2/3 PACKAGE

Dear Mr. Montgomery:

By letter dated June 17, 2008, AREVA submitted an amendment request to the U.S. Nuclear Regulatory Commission for Certificate of Compliance No. 9248.

In connection with the staff's review, we need the information identified in the enclosure to this letter. We request that you provide this information by December 5, 2008. Inform us at your earliest convenience, but no later than November 21, 2008, if you are not able to provide the information by that date. To assist us in re-scheduling your review, you should include a new proposed submittal date and the reasons for the delay.

Please reference Docket No. 71-9248 and TAC No. L24226 in future correspondence related to this request. The staff is available to meet to discuss your proposed responses. If you have any questions regarding this matter, I may be contacted at (301) 492-3323.

Sincerely,

/RA/

Kevin M. Witt, Project Manager
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-9248
TAC No. L24226

Enclosure: Request for Additional Information

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Lynchburg, VA 24506

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Request for Additional Information
AREVA
Docket No. 71-9248
Certificate of Compliance No. 9248
Model No. SP-1/2/3 Package

By application dated June 17, 2008, AREVA requested an amendment to Certificate of Compliance (CoC) No. 9248 for the Model No. SP-1/2/3 package. This request for additional information (RAI) identifies information needed by the U.S. Nuclear Regulatory Commission (NRC) staff in connection with its review of the application. The requested information is listed by chapter number and title in the Safety Analysis Report (SAR). NUREG-1609, "Standard Review Plan for Transportation Packages for Radioactive Material," was used for this review.

Each individual RAI describes information needed by the staff for it to complete its review of the application and to determine whether the applicant has demonstrated compliance with regulatory requirements.

Section 6.0 Criticality Evaluation

The following information is needed to determine compliance with 10 CFR 71.31(a)(1) 71.31(a)(2), 71.33(b), and 71.59(a).

6-1. Provide an applicable benchmark analysis as part of the application.

The applicant relies upon a benchmark analysis that was done for a different package, which refers to the Safety Analysis Report (SAR) for that package. The current amendment application should be a stand-alone document and include the necessary analyses, including the benchmark analysis, to support the application. Furthermore, based upon staff's review, the applicability of the referenced benchmark analysis is not clear. The staff's review indicates that the application analysis (considering the most reactive case, as well as the general analysis results) falls outside the range of applicability for multiple parameters (e.g., enrichment, EALF, etc.); this is especially true when subsets of the benchmarks are considered. The staff notes that several experiments contain materials, such as borated plates and large soluble boron concentrations, which do not apply to the analysis in the application. While the experiments with soluble boron do contain gadolinium (present in the proposed contents), it is not clear that the effect of the gadolinium is not overshadowed by the soluble boron due to its relatively high concentrations.

Demonstration of benchmark applicability should include evaluations of multiple parameters (EALF, H/X, AFG, rod pitch, etc.), with appropriate justification of benchmark applicability for parameters where the application analysis exceeds the parameter range covered by the selected benchmark experiments. The benchmark analysis should also include consideration of subsets of the most applicable experiments in the analysis. The benchmark analysis should ensure that the assumptions in the statistical evaluation for determining bias (such as sample normality, which relies on a minimum sample size) are adequately addressed; therefore, items such as inclusion of additional applicable experiments in the benchmark analysis should be appropriately considered.

6-2. Modify the criticality evaluations for hypothetical accident conditions (HAC) for package arrays to address partial flooding with moderator of varying density.

The staff understands that the Certificate of Compliance (CoC) eliminates preferential flooding by placing restrictions on the polyethylene sheath. However, partial flooding of the packages would arise as the moderator enters the packages. This would lead to conditions such as the moderator flooding the package, so that the assemblies are submerged, but the upper portion of the package is voided. Analyses for similar packages indicate that this kind of partial flooding condition results in a more reactive configuration than uniformly flooded packages. The partial flooding analysis should include variations of moderator density, identifying optimum moderator density.

6-3. Modify the model used for the steel angles in the inner package to be geometrically consistent with or conservative with respect to the angles as described in the licensing drawings.

The staff's review of the sample input indicates that the model of the steel angles result in steel angles that cover more of the basket side than those that are in the actual SP-3 package used as the basis for the model. Thus, steel angles, in the model, shield more of an assembly in one package from an assembly in a neighboring package than the steel angles in the actual package, which is non-conservative. Therefore, the analysis should be modified to model the steel angles, in a manner that is consistent with or conservative with respect to the steel angles, in the SP-3 package (as described in the licensing drawings). Or, the applicant should adequately justify (including quantitative support) that the current model is conservative with respect to the actual package configuration for the steel angles.

6-4. Modify the criticality evaluation to account for the dimension tolerances of the inner container basket.

The staff's review of the criticality evaluation and sample inputs indicates that nominal dimensions were used for the basket. It is not clear that this configuration is more reactive than a basket that is modeled using the tolerances indicated on the licensing drawing for the SP-3 package. Dimensional tolerances should be properly accounted for in the criticality analyses, with consideration given to both positive and negative tolerances; the analyses should use those tolerances that result in the most reactive package (array) configuration or demonstrate that the nominal dimensions result in the most reactive configuration.

6-5. Verify that the most reactive moderator density and assembly orientation (Gadolinia rod orientation) have been identified.

Table 9 of the application summarizes the criticality analyses for the different Gadolinia rod orientations (A through D) considered in the evaluation. The results in this table are used to identify the most reactive cases, which are used in further sensitivity analyses addressing the mass and modeling method of the polyethylene shipping shims. In evaluations of the Gadolinia rod orientations, with the most reactive pellet diameter and cladding inner diameter, it is not clear why Configuration B was not analyzed given that the k-effective values for this configuration are comparable or exceed those for Configuration A, for the other pellet and cladding conditions included in Table 9. Additionally, it is not clear that the most reactive conditions respecting moderator density have been identified for Configuration A, with the most reactive pellet and cladding

dimensions; in other words, it is not clear that higher moderator densities (than 14% full density water) do not result in a more reactive condition than case SP_ATRIUM_10_05_014_348max_A. Thus, it appears that either Configuration A or B may result in a more reactive HAC package array than Configurations C and D. The most reactive configuration should be identified and demonstrated to ensure that the package (array) will remain subcritical and that the Criticality Safety Index is appropriately determined.

6-6. Modify the analysis to define the materials for carbon steel and water to account for molecular effects.

The staff's review of the sample input models indicates that the carbon steel and the mixture of water and carbon steel for the inner container basket are defined with their constituent elements defined individually, instead of with the basic compositions defined in the SCALE code. Thus, the current model's material definitions neglect the influence molecular binding has on the neutron interactions with these materials, which is particularly important for hydrogen in water; staff calculations indicate that neglect of this binding influence is significant and not conservative.

6-7. Include the minimum cladding thickness in the contents specification as proposed for inclusion to the CoC.

The staff's calculations indicate that, with respect to the margin to the upper subcritical limit (USL), small reductions in cladding thickness may have a significant effect on reactivity. Therefore, the minimum cladding thickness should be included as part of the contents specification proposed for inclusion in the CoC. The specified thickness should be supported by the criticality analysis.

6-8. Clarify the following items in the application:

a. The dimensions of the steel angles are 2.1875-in x 2.1875-in x 0.125-in nominal, based upon the licensing drawing for the SP-3 package (for example, Section 2.1 of the application currently states that the angles' dimensions are 2.8125-in x 2.8125-in x 0.125-in).
b. The reduction in the inner package annulus is only to the minimum design dimension, based upon the minimum dimensions of the steel angles in the SP-3 package, as given in the licensing drawing.
c. The most reactive case in the analysis summarized in Table 6 is case SP_ATRIUM_10_05_014_348max_A and not SP_ATRIUM _10_05_013_348max_A.
d. The inner container dimensions listed in Table 1 for the model should be 17.37-in x 10.37-in and not 17.37-in x 11.37-in.

Regarding item b, the application states (see Section 2.1, for example) that the inner container sustained very little damage from the HAC tests, but that the container dimensions, including the annulus dimension, were reduced in the criticality model for conservatism. However, the modeled annulus dimension is the same as the dimension given in the licensing drawing for the inner container, based upon the steel angle dimensions given in that drawing for the SP-3 package. Therefore, the annulus model is equivalent to the design; (conservatively) accounting for any accident effects would require a further reduction of the annulus dimension. Provide further clarification of this issue.