March 15, 2005

Mr. Delmar F. Billings, Director
Office of Hazardous Materials
Exemptions and Approvals
U.S. Department of Transportation
400 Seventh Street, S.W.
Washington, D.C. 20590

SUBJECT: U. S. DEPARTMENT OF ENERGY'S EXEMPTION REQUEST

Dear Mr. Billings:

This is in response to your letter dated November 23, 2004, requesting our recommendation regarding the U.S. Department of Energy's (DOE's) request for an exemption from 49 CFR 173.453(d) requirement in order to ship 227 55-gallon drums containing uranium trioxide (UO_3), enriched in U-235 up to 1.084 wt%, as a fissile-exempt shipment.

Based upon our review, the statements and representations contained in the request and in the supporting documents, we recommend that DOE provide responses to the attached Request for Additional Information (RAI). Most of the issues raised in your letter are also included as part of the RAI. With respect to your question regarding "Whether there is no Type A fissile packaging that could be used to achieve full regulatory compliance," there are only a few U.S. certified Type A fissile packages which would not have to have a revised certificate of compliance in order to ship UO_3. However, using any of these packagings would require significant repackaging of the proposed content. For example, one particular Type A fissile package is authorized to carry up to 1423 lbs of UO_2 pellets or powder enriched up to 4.5%, but the material would have to be repackaged in four separate inner containers that make up the package. Additionally, the certificate would need to be revised to allow UO_3. There are some DOT-revalidated foreign packages for shipping similar materials, but they are similar to U.S. approved packages with respect to the amount of material which can be shipped, and would also require significant repackaging.

In general, the NRC staff believes it is more appropriate to request an exemption (with sufficient justification and demonstration of equivalent safety) from the packaging requirements than from material definition. It appears to be more appropriate for DOE to request exemption from 49 CFR 173.417, "Authorized fissile materials packages" instead of a request for an exemption from the "Fissile material - exception." NRC staff does not recommend calling UO_3 with U-235 enrichment above 1 percent a fissile-excepted material.

If you have any questions regarding this matter, please contact me at (301) 415-8500.

Sincerely,

/RA/

Meraj Rahimi, Senior Project Manager
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

TAC No.: L23787

Enclosure: Request for Additional Information

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If you have any questions regarding this matter, please contact me at (301) 415-8500.

Sincerely,

/RA/

Meraj Rahimi, Senior Project Manager
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

TAC No.: L23787

Enclosure: Request for Additional Information

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ML050770090 * See Previous Concurrence

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DOE Request for Exemption from 49 CFR 173.453(d)

Request for Additional Information

1. Revise the criticality analysis to include the appropriate uncertainty in establishing the maximum enrichment.

   It is not clear from the criticality evaluation whether or not the measurement uncertainty was included in the maximum enrichment considered in the calculations. The enrichment value for the material considered in the calculation should be the measured value plus the measurement uncertainty. Furthermore, the basis for the 1.3% measurement uncertainty is not known. There are no measurement uncertainties indicated in Attachment 2C which includes the initial measurements for U-235 for all the drums except one in March 1986. Attachment 2B, which includes measurements of U-235 on selected drums for validation purposes, indicate 3.5% as the measurement uncertainty.

2. Revise the criticality analysis based on a bounding value for UO_3 weight per drum.

   The criticality analysis under normal conditions of transport assumed 750 lbs of UO_3 per drum. Attachment 1 shows that the majority of drums to be shipped exceed 750 lbs. The criticality analysis for normal conditions of transport should be revised to bound the amount of material to be shipped.

3. Revise the application to provide more information about how the range of applicability of the benchmark analysis was extrapolated down to 0.5 weight-percent from 2.0 weight-percent. Reference 5 should be provided as well as an explanation of how the guidance from this document was applied to the benchmark data in the criticality analysis.

4. Revise the criticality analysis to show how the 2.2% bias for the calculations using MCNP was determined. Additionally, the staff does not agree that a 3% administrative margin on k_{eff} is appropriate for the criticality analysis, considering the magnitude of the code bias and the fact that the enrichment for the material to be shipped lies outside of the range of applicability of the benchmark analysis. A revised analysis should include a 5% administrative margin on k_{eff}.

5. Revise the criticality analysis to consider 2N damaged packages according to the requirements of 10 CFR 71.59(a). The criticality analysis for damaged packages considers the maximum subcritical mass of UO_3, optimally moderated in a spherical configuration. This mass should be considered to represent a number of packages, 2N, for the determination of a CSI. For instance, the applicant calculated that 5,250 kg of 1.084% enriched UO_3 would be safely subcritical under hypothetical accident conditions. At 340 kg per package, this mass represents approximately 15 packages, and N = 7.5 packages. Therefore, CSI = 50/7.5 = 6.7, meaning that up to 7 packages could be shipped in a non-exclusive use vehicle, and up to 14 could be shipped in an exclusive use vehicle.

6. Specify the total number of drums. Contradictory information is provided on the total numbers (380, 381, and 382) in the attached reports.

7. Specify other elements included in the UO_3 mixture, and whether they include plutonium, uranium-233, beryllium, graphite, or hydrogenous material enriched in deuterium as described in 49 CFR 173.453(d). If any of these elements are present, they need to be modeled in the criticality analyses.

8. Use the Criticality Safety Index (CSI) instead of Transport Index (TI) per revised regulations effective October 1, 2004.

9. State explicitly that the shipments will be made in exclusive use vehicles.