September 9, 2005

Mr. Richard W. Boyle, Chief
Radioactive Materials Branch
Office of Hazards Material Technology
U.S. Department of Transportation
400 Seventh Street S.W.
Washington, D.C. 20590

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION

Dear Mr. Boyle:

This is in response to your letter dated April 8, 2005, requesting our assistance in evaluating the Model No. TN-106 transport package authorized by the French Certificate of Approval No. F/379/B(U)F-96.

In connection with our review, we need the information identified in the enclosure to this letter. To assist us in scheduling staff review of your response, we request that you provide this information by 60 days of the date of this letter. If you are unable to provide a response by that date, our review may be delayed.

If you have any questions regarding this matter, I may be contacted at (301) 415-8500.

Sincerely,

/RA/

Shawn A. Williams, Project Manager
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-3075
TAC No. L23838

Enclosure: Request for Additional Information

Mr. Richard W. Boyle, Chief
Radioactive Materials Branch
Office of Hazards Material Technology
U.S. Department of Transportation
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Washington, D.C. 20590

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OFC	SFPO	N	SFPO	N	SFPO	N	SFPO	N	SFPO	N
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Request for Additional Information
Docket No. 71-3075
Model No. TN-106
French Package Design
Certificate No. F/379/B(U)F-96

The U.S. Department of Transportation (DOT), by letter dated February 8, 2005, requested the U.S. Nuclear Regulatory Commission's (NRC) recommendation concerning the United States revalidation of French Certificate of Approval No. F/379/B(U)F-96 for the Cogema Logistics' transportation package Model No. TN-106. The International Atomic Energy Agency (IAEA) Safety Standards Series No. TS-R-1, "Regulation for the Safe Transport of Radioactive Materials," 1996 Edition (As amended 2003) was used for this review. This request describes information needed by NRC for it to complete its review and to determine whether to recommend to DOT, United States revalidation of this certificate.

STRUCTURAL

1. Refer to Chapter 1, Appendix 3, pages 6 and 7. Provide justification for the tie-down attachments and handling devices acceleration factors used. These factors are not as recommended in IAEA Safety Guide No. TS-G-1.1 (ST-2).

   This information is needed to show compliance with IAEA No. TS-R-1, paragraphs 650 and 636.

2. Refer to Chapter 1, Appendix 3, pages 6 and 7. If the applicant plans to ship the package using sea/water transport mode, provide calculations demonstrating that the package is able to withstand the accelerations factors recommended for design of the tie-down and handling devices, as these acceleration factors are slightly different than those recommended for road transport, per IAEA Safety Guide TS-G-1.1 (ST-2) Table V.1.

   This information is needed to show compliance with IAEA No. TS-R-1, paragraphs 650 and 636.

3. One of the conditions in the French Certificate, Appendix 0A, page 4/15, is "to set the cavity to a negative pressure of 0.2 bar after closing the packaging (the gas used to fill the cavity can be air or any other natural gas)." Provide a discussion and the implication of this negative pressure, and if necessary, calculations to ensure that, the results of the ½ scale model tests performed for various regulatory drop scenarios are still valid.

   This information is needed to show compliance with IAEA No. TS-R-1, paragraph 727.

MATERIALS

Materials RAIs number 1-5 are needed to show compliance with IAEA No. TS-R-1, paragraph 501c, requiring the confirmation of the presence and distribution of neutron poisons, 615 and 664, requiring the design to account for ambient pressures and temperatures, 651b, requiring that there is no cracking or melting of the radiation shielding material due to thermal expansion, and 656 bi, requiring that the radiation shield survive a 9 meter drop.

1. Provide manufacturing specification/data sheet for the Resin F being used for the neutron shield. The specification should include the useful range of operation (radiation and temperature), mechanical properties, thermal conductivity, and melting point.

   The manufacturing data is needed to verify the durability of the resin. In particular, it is needed to determine if the material is qualified at the temperatures and stresses at or above the design limits for the package.

2. For the Resin F, describe how excessive neutron streaming will not occur as a result of shrinkage at extreme cold temperatures such as -40°C.

   The safety analysis report (SAR) states in Chapter 0, Section 6, that "these materials do not degrade in regulatory temperature conditions, which range from -40°C to 70°C." Polymers, Resin F, generally have a relatively large coefficient of thermal expansion when compared to metals. There is no coefficient of thermal expansion for Resin F listed in Table 0.5, Chapter 0.

3. Indicate the "equivalent materials" that could be used for Resin F. Describe how the equivalent materials were tested and how that data correlated with the Resin F test data regarding shielding, thermal stability, and handling properties during mixing and pouring or casting.

   The SAR states in Chapter 0, Section 6, that "equivalent materials to those specified in this safety analysis report could be used subject to justification of behavior which does not contradict the conclusions of the safety demonstrations."

4. Describe the acceptance tests that were conducted to verify that any filled channels/cavities with Resin F used on casks do not have significant voids or defects that could lead to greater than calculated dose rates.

   There is no information in the SAR explaining how the applicant will ensure the pour is uniform or free from voids.

5. Discuss the acceptance tests to confirm the B-10 areal density in the Resin F. The discussion should include test(s) (i.e., neutron attenuation), acceptance criteria, and sampling plan for the resin.

6. Describe the inert matrices for the UO_2 alluded to in Appendix 1a.

   This information is needed to show compliance with IAEA No. TS-R-1, paragraph 613.

7. Explain how the water is dried from the leak tight capsule.

   Section 2.2 of the Certificate states the "the contents can be placed in internal arrangement made from aluminum or stainless steel which may or may not be leak tight."

   This information is needed to show compliance with IAEA No. TS-R-1, paragraphs 642 and 651.

8. Provide evidence that the proposed drying procedure, "the pressure is dropped between 6 and 10 mbars and held with no more than a 1 mbar rise over a 5 minute period," will actually result in drying the package cavity.

   This information is needed to show compliance with IAEA No. TS-R-1, paragraphs 642 and 651c.

9. Provide a reference for the Young's modulus of 42 GPa for Pb as presented in Chapter 1, Appendix 3, Section 6.1.2.

   This information is needed to show compliance with IAEA No. TS-R-1, paragraph 656bi.

10. Provide a reference source for the conductivity and emissivity values of the black painted steel listed in Table 2-1.1, Chapter 2, Appendix 1.

    This information is needed to show compliance with IAEA No. TS-R-1, paragraph 615.

CONTAINMENT

Containment RAIs number 1-6 is needed to show compliance with IAEA No. TS-R-1, paragraph 656.

1. Include crud (Co-60) in the source term or justify its omission. If crud is not included in the source term, describe the administrative controls to preclude it.

   The Table in Section 5.1.1, Chapter 0A, does not include Co-60. Staff would expect some Co-60 to be present as a corrosion product.

2. Include an assessment under the Normal Conditions of Transport (NCT) of the effect of aerosols and volitiles from the damaged fuel which would be assumed to be 100% failed at the time of loading.

   The French Certificate, Appendix 1A, Contents No. 1, "Fuel Pins or Rods Consisting of Uranium Oxide" includes the possibility of shipment of damaged fuel or capsules of which the percentage of damaged fuel has not been limited. Therefore, consideration of a shipment of 100% damaged fuel needs to be evaluated and the consequence of the release of aerosols and volitiles evaluated under NCT. Table 3A.4, Chapter 3A, only evaluates aerosols and volitiles for the 1 or 3 rods out of 50 assumed to fail under NCT.

3. Justify the source term presented in Chapter 0A, Section 5.1, by describing how it was calculated and include identification of the parameters upon which it was determined (e.g., maximum burnup, enrichment, cooling time, average power, geometry). Specifically justify how the values associated with 100 GWD/MTU were determined.

4. Calculate and submit the maximum permissible leakage rate for the NCT and accident conditions of transport using the methods described in ANSI 14.5 for the source term associated with Contents No. 1.

   Using this approach the staff feels that a leaktight containment may be required.

5. Provide reference no. <3> as indicated in Chapter 0A, Section 7, page 22.

   In Chapter 0A, Section 5.1.4, it is assumed that only 5% of the fission gases are released from a fail fuel rod. The NRC assumes 30% of the fission gases are released.

6. Justify the practice of transport under vacuum to minimize the calculated release. Describe the controls in place to prevent a single failure from losing vacuum in the package or falsely indicating vacuum conditions in the package.

   It is the NRC's practice not to give credit for transport under vacuum conditions.

SHIELDING

This information is needed to show compliance with IAEA No. TS-R-1, paragraphs 531 and 532 for normal conditions of operation and with paragraph 656 for accident conditions.

1. Provide the geometric properties for Contents No.1 in the French Certificate.

   The French Certificate, Appendix 1A, Contents No. 1, "Fuel Pins or Rods Consisting of Uranium Oxide," states "the geometric properties (diameter, thickness and nature of the cladding, etc.) does not matter." To do a confirmatory calculation for the source term, basic fuel parameters such as pitch, pellet diameter, cladding material and thickness, etc., are needed.

2. Explain how the generic gamma and neutron source term described in Chapter 4A, Appendix 1, "Study of the Shielding of TN-106 Packaging," can be considered representative of irradiated UOx fuel rods or pins.

   A cooling time of 4 years appears to be considered in the calculations. However a minimum time of 3 months is indicated in the description for Contents No. 1 which is the only contents being considered in this review. Fuel with the shorter cooling time would have a greater amount of short-lived fission products which would contribute to the gamma dose. The dose rate from fuel with a shorter cooling time may have a significantly higher dose.

3. Provide the maximum activity in Becquerels for the neutron source.

   In Chapter 4A, Appendix 1, Section 3.2, there is a generalized explanation of how the neutron source term was determine using Am-241 but no activity amount was included.

CRITICALITY

1. Provide the correct material specification of the resin.

   Both Table 5A-1.1 in Chapter 6 (Criticality) and page 10 of Attachment 6 (TN-106 Criticality Analysis, Calc 41199-02) state that the resin contains zinc. However Table 4A-1.2 states that the resin contains copper.

   This information is needed to show compliance with IAEA No. TS-R-1, paragraphs 806(b) and 813.

2. Provide additional justification for the use of lattice cross-sections with homogenized geometry.

   Section 5.2 of Attachment 6 states that in order to simplify the calculations cell weighted cross-sections were generated considering heterogeneous fuel pellets and moderator and these cross sections were then applied to a homogenous fuel/moderator volume. Further explanation is needed to determine the implications of this simplification.

   This information is needed to show compliance with IAEA No. TS-R-1, paragraph 673.