February 25, 2009

Mr. Patrick L. Paquin
GM – Engineering & Licensing
Energy*Solutions*
140 Stoneridge Drive
Columbia, SC 29210

SUBJECT: SECOND ROUND REQUEST FOR ADDITIONAL INFORMATION FOR REVIEW OF THE MODEL NO. 10-160B TRANSPORTATION PACKAGE

Dear Mr. Paquin:

By letter dated December 20, 2007, Energy*Solutions* submitted an amendment request to the U.S. Nuclear Regulatory Commission for Certificate of Compliance No. 9204. You requested a "-96" designation to the package identification number, the addition of fissile material to the authorized contents, and modification of the approval process for TRU wastes. Additionally, by letter dated October 3, 2008, you submitted a response to the Request for Additional Information (RAI) letter issued by the staff on August 8, 2008.

In connection with the staff's review of your original submittal and responses to the first round RAI, the staff is issuing the enclosed second round RAI. We request that you provide this information by April 14, 2009. Inform us at your earliest convenience, 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. 71-9204 and TAC No. L24162 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) 492-3292.

Sincerely,

/RA/

Michele M. Sampson, Sr. Project Manager
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-9204
TAC No. L24162

Enclosure: Second Request for Additional Information

Mr. Patrick L. Paquin
GM – Engineering & Licensing
Energy*Solutions*
140 Stoneridge Drive
Columbia, SC 29210

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NAME:	MSampson		VWilson		PLien		NSanfilippo		LCampbell		MDeBose	
DATE:	02/24/2009		02/25/2009		02/24/2009		02/25/2009		02/25/2009		02/25/2009	
OFC:	SFST											
NAME:	EBenner											
DATE:	02/25/2009											

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Second Request for Additional Information
Energy*Solutions*
Docket No. 71-9204
Certificate of Compliance No. 9204
Model No. 10-160B

By application dated December 20, 2007, as supplemented on October 3, 2008, Energy*Solutions* requested an amendment for the Model No. 10-160B. 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 amendment. The requested information is listed by chapter number and title in the applicant's safety analysis report.

Each individual RAI describes information needed by the staff for it to complete its review of the application and/or the SAR and to determine whether the applicant has demonstrated compliance with the regulatory requirement. NUREG-1609, "Standard Review Plan for Transportation Packages for Radioactive Material," was used by the staff in its review of the application.

3-0 THERMAL EVALUATION

3-1 (a) Explain the calculation, in detail, for the maximum fire shield temperature (1361° F) as reported in Table 3-4 as a result of the cask being exposed to a fire with an average environmental temperature of 1475° F for the thermal analysis of the 10-160B package.

(b) Provide the ANSYS input files for NCT and HAC analyses for confirmatory analysis.

This information is required to show compliance with 10 CFR 71.71 and 71.73.

3-2 Provide the dimension of the air gap between the fire-shield and the cask body. Also explain the effect of the air gap on heat transfer characteristics of the 10-160B, particularly during the HAC.

Figures 1-1 and 3.1 indicate the existence of an air gap between the fire shield and the outer shell of the 10-160B cask body. Energy*Solutions* drawing, C110-D-29003-010, *Cask Assembly General Notes/Parts List,* does not quantify the air gap between fire shield and the outer shell of the cask. In light of significant temperature drop from the fire-shield to outer shell temperature (1361° F to 249° F), the staff needs to know the gap size and its effect on heat transfer in the thermal model.

This information is required to show compliance with 10 CFR 71.33 and 71.73.

3-3 Provide assurance with supporting calculations that the accuracy of seal temperature is not compromised due to the fact that the seal is not explicitly modeled in the hypothetical accident thermal evaluation.

Section 3.5.3 of SAR indicates that "*The cask seals are not explicitly modeled. However, the maximum seal temperature is conservatively set equal to the maximum calculated temperature of the cask body, 252° F. However, the maximum seal temperature will not exceed the maximum temperature of the cask body, 252° F. Thus, the seal temperature is conservatively set equal to the maximum calculated temperature of the cask body plus 100° F for an analyzed maximum of 352° F.*"

Explain how the licensee concludes that the maximum seal temperature during HAC fire will not exceed the maximum temperature of the cask body.

This information is required to show compliance with 10 CFR 71.33 and 71.73.

3-4 Explain and justify the thermal boundary condition on the inside surface of the cask.

In the modeling of internal heat loading, the applicant converted the heat source term into a heat flux boundary condition. This assumption bypasses the calculation of temperature of material contents (cargo) within the cask cavity. With this assumption, the temperature of the cavity content is presumed to be higher than the shell. However, in SAR Sections 3.4.4 and 3.5.4 for *Maximum Internal Pressures* sections, the gas mixture within cask is set equal to the average inside surface temperature of the cask. This gas mixture temperature assumption is non-conservative and conflicts with the heat flux assumption.

This information is required to show compliance with 10 CFR 71.33 and 71.73.

4-0 CONTAINMENT

4-1 Provide helium permeability of the chosen elastomeric seals as a function of operating temperature. Provide a comprehensive leak test plan, considering the helium permeation, to demonstrate the compliance of allowable leakage rate analyzed in containment analysis.

The licensee indicated that using a He leak test could achieve a more conservative leak rate of 1.0e-7 atm-cm3/sec. In light of high helium permeability through elastomers, the measured actual leakage rate could possibly include the helium permeation rate in certain conditions. The helium permeation effects could generate errors in leak test measurement.

This information is required by the staff to assess compliance with 10 CFR 71.33 and 71.51.

4-2 Explain the scenarios in Criteria ii) in SAR Section 4.8 and justify using inerting method to ensure safe shipment of vessels which generate combustible gas.

The criterion states “the secondary container and the cask cavity (if required) must be inerted with a diluent to assure the oxygen, including that radiolytically generated, shall be limited to 5% by volume <u>in those portions of the package which could have hydrogen greater than 5%.</u> Based on the methodology in Appendix 4.10.2, the intent of the gas generation methodology is to limit the hydrogen generation under 5%.” Criterion ii) shows potential scenarios that are inconsistent with the gas generation methodology. The applicant needs to explain the scenarios of hydrogen concentration greater than 5% and justify the inconsistency. In addition, the licensee needs to describe the detailed procedure and methodology to demonstrate that the inerting procedure limits the oxygen content to below 5% and justify the mixture is nonflammable.

This information is required by the staff to assess compliance with 10 CFR 71.43(d).

4-3 Describe specific parts of the sub-tier appendices to be under payload engineer control in the amendment request.

According to the response licensee provided, the applicant requests the site specific sub-tier appendices (4.10.2.1 to 4.10.2.5) to be evaluated and maintained by payload engineer without NRC approval. Currently, the site specific appendices (4.10.2.1 to 4.10.2.5) include content codes and detailed methodologies which demonstrate the compliance to Appendix 4.10.2. These compliance methodologies contain detailed data and calculations which are not elaborated in the main appendix 4.10.2. These methodologies are important for staff to evaluate package compliance.

This information is required by the staff to assess compliance with 10 CFR 71.33.

5-0 SHIELDING EVALUATION

5-1 The staff needs additional clarifying information on the shipment of neutron sources.

Based on the analyses in the SAR, the staff plans to place restrictions on the shipment of neutron sources. Confirm that these details are adequate to meet your shipping requirements, alternatively, provide additional analytical information supporting shipment of additional sources.

The first part of CoC Paragraph 5.(b) (2) will be revised to read:

> Maximum quantity of material per package
>
> Type B quantity of radioactive material, not to exceed 3,000 times a Type A quantity for gamma emitting materials.
>
> The only neutron sources permitted for shipment are special form Pu239-Be sources that must meet the requirements of 10 CFR 71.75 and have a maximum emission rate of 2.8E+7 n/sec.
>
> For any combination of nuclides present a sum of “partial fractions” must be less than or equal to one.
>
> Gamma and neutron emitting sources may be shipped together as long as the sum of “partial fractions” is less than 1.

$$\sum_{i=1}^{n} \frac{a_i}{A_{GN_i}} \leq 1$$

> Where for a particular payload mix, a_i is the actual activity of source “i” and A_{GN} is the limiting activity of source “i.”
>
> This information is needed to satisfy the requirements of 71.33(b).

5-2 Please provide additional details on the methods of compliance and verification in Appendix 4.10.2.

The staff understands that dose rate measurements will be made for the 10-160B payload since the contents cannot always be known with full certainty. Identify where, or include in Appendix 4.10.2 the details, including the quality assurance program, of how these dose rate measurements will be made. Identify where, or include the limits (200 mrem/hr at the surface, and 10 mrem/hr at 2 meters) in Appendix 4.10.2.

This information is needed to determine compliance with 10 CFR 71.47.

5-3 Add the actual FGE factors from the RH-TRAMPAC document to Appendix 4.10.2.

This information is needed to satisfy the requirements of 71.33(b).