

July 23, 2012

Mr. Donald R. Krause  
Manager, Regulatory Compliance and EHS  
GE Hitachi Nuclear Energy  
Vallecitos Nuclear Center  
6705 Vallecitos Rd  
Sunol, CA 94586

SUBJECT: REQUEST FOR INFORMATION FOR CONTINUED USE OF THE  
MODEL NO. 2000 PACKAGE, CERTIFICATE OF COMPLIANCE NO.  
9228.

Dear Mr. Krause:

The enclosed Request for Information is being issued to GE Hitachi Nuclear Energy (GEH) as a result of our preliminary evaluation of your Certificate of Compliance (CoC) No. 9228 for the Model No. 2000 package and its supporting application. The staff performed this evaluation after being apprised of dose rate issues and changes in basket configuration (Inspection Report IR 05000461/2012002.)

CoC Condition No. 5(a)(3)(ix) specifies that an "optional" inner shield liner can be used in the package in accordance with drawing 129D4922, Rev. 2. In a conversation with staff on May 22, 2012, (ML12164A774), GEH stated that the optional lead liner is partially used, without the shield lid component. GEH stated that the inner shield lid does not fit inside the package and was not intended for use in this package. Pursuant to 10 CFR 71.39, staff is seeking information in order to determine whether your CoC should be modified, suspended or revoked.

The staff is reviewing potentially safety-significant issues pertaining to (i) the shielding evaluation for contents below 600 Watts, as defined in Condition No. 5(b)(1)(ii) of the CoC, and (ii) the use of the optional shielding liner without the shield lid. The staff is also examining issues related to the variable shield thickness of the barrel racks, the configuration and shielding specifications for <sup>60</sup>Co sources above 600 Watts, and the overall evaluation of variable contents, in order to understand the original certification basis for the package.

The staff understands that a shipment using the Model No. 2000 package is planned in early September. GEH is requested to submit, within 30 days of the date of this letter, responses to this Request for Information.

If you have any questions regarding this matter, please contact Pierre Saverot at (301) 492-3408.

Sincerely,

**/RA/**

Mark D. Lombard, Director  
Division of Spent Fuel Storage and Transportation  
Office of Nuclear Material Safety  
and Safeguards

Docket No. 71-9228  
TAC No. LA0129

Enclosure: Request for Information

D. Krause

-2-

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Enclosure: Request for Information

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<b>OFC</b>	SFST	E	SFST	SFST	SFST		SFST	
<b>NAME</b>	PSaverot		VWilson	MRahimi	NDay		DPstrak	
<b>DATE</b>	06/27/2012		06/28/2012	07/05/2012	06/28/2012		07/09/2012	
<b>OFC</b>	SFST	E	SFST	SFST	SFST		SFST	
<b>NAME</b>	EBenner		MDeBose	MWaters	DWeaver		MLombard	
<b>DATE</b>	07/05/2012		06/29/2012	07/16/2012	7/18/12		7/23/12	

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**Request for Information  
For the Model No. 2000 package  
Docket No. 71-9228**

**Use of Inner Shield Liner**

1. Provide the following information regarding the determination made by users to insert the inner shield liner without the shield lid:
  - a. Clarify if the inner shield lid is credited in the package analysis for normal conditions of transport (NCT) and hypothetical accident conditions (HAC).
  - b. Discuss why the inner shield lid specified in CoC Condition No. 5(a)(3)(ix) does not fit and was not intended for use in the package.
  - c. Discuss the reasons for specifying the inner shield liner in the design drawings provided to NRC for approval and for continuing to specify it in subsequent certificate renewals.
  - d. Discuss how the use or non-use of the inner shield is communicated to the users of the package.
  - e. Discuss also if there are any specifications or notes in the supporting application (including drawing 129D4922) that indicate that the shield liner is permitted to be used without the shield lid.

In a conversation with NRC staff on May 22, 2012, (ML12164A774), GEH stated that the optional lead liner depicted in drawing 129D4922 is partially used, without the shield lid component. GEH stated that the inner shield lid does not fit inside the package and was not intended for use in this package. However, the shielding calculations that form the licensing basis for shipments of contents below 600 Watts, in Condition No. 5(b)(1)(ii) of the CoC, for NCT and HAC, assume that the lead liner is inserted in the package in its entirety (NEDO-31581 Rev. 1 Pages 5-2 and 5-14).

This information is required by the staff to determine compliance with the requirements of 10 CFR 71.95 and 10 CFR 71.107.

2. Provide the following information regarding the optional use of the inner shield liner (any or all components) for the package as described in CoC Condition No. 5(a)(3)(ix):
  - a. Discuss the procedure that describes the use of this component for the users of the package, including the applicable criteria when deciding that an "optional" component becomes necessary for the package.

- b. State if any shipments of contents described in Condition No. 5(b)(1)(i) and 5(b)(1)(ii) of the CoC have been performed in an horizontal configuration, and discuss how modifications can be made to the lid to fit in this configuration, as required by Condition No. 16 of the CoC.

CoC Condition No. 5(a)(3)(ix) states that the lead liner is an optional component of the package. However, the Safety Evaluation Report (SER), Rev. 0, issued by NRC staff, references drawing 129D4922 and appears to credit it in the original safety approval. The lead liner is discussed in NEDO-31581 Rev. 1, "Model 2000, Radioactive Material Transport Package," in Section 1.2.1 and illustrated on Figure 1.2.3.

This information is required by the staff to determine compliance with the requirements of 10 CFR 71.95 and 10 CFR 71.107.

- 3. Provide the following information regarding the HAC performance of the package when not using the inner shield liner, or when using it without the shield lid:
  - a. Justify that allowable sources below 600 Watts will meet HAC regulatory dose rate limits without the liner as a required component, and in a partial configuration with no shield lid, for contents described in Condition No. 5(b)(1)(ii) of the CoC.

Staff performed preliminary analyses that indicate that  $^{60}\text{Co}$  sources (from 100 to 600 Watts) could exceed HAC dose rate limits without the additional shielding provided by the liner. In addition, staff noticed that the area between the top of the liner and the lid is the location where the greatest streaming effects are observed.

- b. Justify that the shield liner installed in a configuration with and without the shield lid will maintain its configuration under HAC, as credited in application.

The package licensing basis used finite element analyses (FEA) and a  $\frac{1}{4}$  scale drop testing for the 30 ft drop test. However, the optional liner does not appear to have been considered in the FEA or scaled drop testing. It also appears that the shield liner could be subject to buckling and failure in a configuration without the shield lid. The liner consists of lead held together with a 0.38" stainless steel shell.

- c. Evaluate the possibility of the source getting lodged in the gap between the liner body and the lid of the cask after HAC and calculate resultant dose rates.

When the optional lead liner (drawing 129D4922, Rev. 2) is used in a configuration without a lid, it appears that sources may no longer be contained within the liner bounds after HAC because of a gap of multiple inches between the shield liner body and the structural lid of the package.

- d. Justify whether streaming effects should be analyzed in both the NCT and HAC evaluations for the package.

Streaming effects are not accounted for in the shielding calculations that form the licensing basis, as documented in NEDO-31581 Rev. 1, "Model 2000, Radioactive Material Transport Package," page 5-8, for shipments of contents below 600 Watts for Condition No. 5(b)(1)(ii) of the CoC, and in NEDO-32318, "Model 2000, Radioactive Material Transport Package, 2000 Watts Decay Heat Upgrade, Safety Analysis Report," page 5-7, for contents between 600 and 2,000 Watts. The events at the Clinton Nuclear Generating Station, where unexpected high dose rates were observed, thus requiring the package to be shipped in a closed configuration, demonstrate that streaming paths with sources in elevated positions may produce higher than expected dose rates.

- e. Discuss the effects of lead slump in the main package shielding on the HAC dose rates in the shielding analyses.

Lead slump does not appear to be accounted for in the analyses for HAC conditions; however, Page 2-106 of NEDO-31581 Rev. 1, "Model 2000, Radioactive Material Transport Package" indicates that this effect is analyzed in the HAC structural analyses.

This information is required by the staff to determine compliance with the requirements of 10 CFR 71.51(a)(2), 10 CFR 71.73, and 10 CFR 71.47.

- 4. Provide the following information regarding the NCT performance of the package when not using the inner shield liner, or when using it without the shield lid:

- a. Justify that allowable sources below 600 Watts will meet NCT regulatory dose rate limits without the liner as a required component, and in a partial configuration with no shield lid for contents described in Condition No. 5(b)(1)(ii) of the CoC.

The shielding calculations for NCT that form the licensing basis for shipments of contents below 600 Watts for Condition No. 5(b)(1)(ii) of the CoC appear to credit the "optional" lead liner (Reference NEDO-31581 Rev. 1, "Model 2000, Radioactive Material Transport Package," page 5-2).

- b. Provide the structural analysis of the optional lead liner for NCT conditions.

This information is required by the staff to determine compliance with the requirements of 10 CFR 71.47 and 10 CFR 71.71.

## **ORIGINAL CERTIFICATION BASIS**

5. The shielding calculations that form the licensing basis for shipments of contents below 600 Watts for Condition No. 5(b)(1)(ii) of the CoC assume a cylindrical geometry during NCT (Section 5.4.2 of NEDO-31581 Rev. 1, "Model 2000, Radioactive Material Transport Package," page 5-14).
  - a. Provide additional information justifying that this cylindrical geometry, including any assumed self-shielding, is bounding under NCT for any and all other geometries allowed arrangements of the authorized contents.
  - b. Provide a structural justification demonstrating that the sources remain shored so that there is no deviation from this "cylindrical" geometry, or justify that other possible geometry will meet regulatory dose rate limits.

This information is required by the staff to determine compliance with the requirements of 10 CFR 71.51 and 10 CFR 71.71.

6. Clarify the procedure used to convert source activity to source decay heat for contents below 600 Watts. Explain how package's users perform this conversion and how consistency is ensured for each use of the package.

Expressing content's limits in terms of decay heat (Watts) may be ambiguous and, unless the procedure for converting an activity to watts is consistent, will not result in an adequate estimation of shielding capability. For example, the procedure for calculating the decay heat from the activity is described on page 5-14 of NEDO-32318, "Model 2000, Radioactive Material Transport Package, 2000 Watts Decay Heat Upgrade, Safety Analysis Report." For Co-60 this procedure includes the gamma energies and one third of the beta energy. Other ways to perform this conversion is to use the published Q value of the reaction, or to only account for the gamma energy and neglect the beta. This procedure can be more complicated for other nuclides with radioactive daughter isotopes. This document states on page 5-15: *"The presentation of the activity equivalence to 2000 watts can be misinterpreted if it is not clear whether the activity refers only to the parent isotope or to the combined activity of the parent plus the daughter."*

The SAR for contents below 600 Watts is documented in a different document, NEDO-31581, and is silent on instructing users on how to perform this conversion. The staff also notes that there are no operating procedures that instruct users on how this conversion is to be done.

This information is required by the staff to determine compliance with the requirements of 10 CFR 71.107.



7. Justify how specific basket configurations are determined and installed by users of the package for contents above 600 Watts. Justify that undefined basket configurations will not result in dose rates exceeding NCT and HAC dose limits

Table 1.1 of NEDO-32318, "Model 2000, Radioactive Material Transport Package, 2000 Watts Decay Heat Upgrade, Safety Analysis Report" shows specific basket configurations that are to be used for various contents when shipping 600-2000 Watts of contents for Condition No. 5(b)(1)(ii) of the CoC. These are not currently included as requirements of the CoC or within the associated operating procedures.

This information is required by the staff to determine compliance with the requirements of 10 CFR 71.47, 10 CFR 71.71 and 10 CFR 71.73.

8. Justify that specific nuclides are bounding for all radionuclides (neutron and gamma sources) that can be shipped.

The licensing basis for contents in Condition No. 5(b)(1)(ii) of the CoC is not specific to any radionuclide; however, the shielding analysis performed below 600 watts (Page 5-15 of NEDO-31581 Rev. 1 "Model 2000, Radioactive Material Transport Package") is limited to Cobalt-60, Cesium-137, Zirconium-95/Niobium-95, and Hafnium-181.

For contents between 600 and 2000 Watts, the shielding analysis is limited to Cesium-137, Cobalt-60, Hafnium-181, Iridium-192, Strontium/Yttrium-90, and Zirconium/Niobium-95 (Page 5-1 of NEDO-32318, "Model 2000, Radioactive Material Transport Package, 2000 Watts Decay Heat Upgrade, Safety Analysis Report").

This information is required by the staff to determine compliance with the requirements of 10 CFR 71.33(b).

9. Provide an analysis to justify that all contents of the package specified under Condition No. 5(b)(1)(ii) of the CoC with shoring/carrier racks meet HAC conditions. Also provide the procedure for shoring, or for using the carrier racks, that is consistent with what was analyzed.

Condition No. 13 of the CoC, Rev. 5, states: "Appropriate carrier racks or shoring must be provided to minimize movement of contents during accident conditions of transport." It does not appear that carrier racks or shoring devices were considered in the finite element analyses or scaled drop testing.

This information is required by the staff to determine compliance with the requirements of 10 CFR 71.73.