



**HITACHI**

GE Hitachi  
Nuclear Energy

**Donald R. Krause**  
Mgr., Regulatory Compliance & EHS  
Vallecitos Nuclear Center  
6705 Vallecitos Rd  
Sunol, CA 94586  
USA

T 925 862 4360  
F 925-304-7435  
donald.krause@ge.com

April 14, 2010

Ms. Michele M. Sampson, Sr. Project Manager  
Licensing Branch  
Division of Spent Fuel Storage and Transportation  
Office of Nuclear Material Safety and Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-001

ATTN: Document Control Desk

**Subject:** RAI RESPONSES FOR REVIEW OF THE MODEL NO. GE-100 PACKAGE  
LIMITED AUTHORIZATION

**References:**

- 1) NRC Letter to D.R. Krause, GEH, "Authorization for Limited Shipments in the Model No. GE-100 Package, Certificate of Compliance No. 5926", Dated January 16, 2009.
- 2) Letter, GEH to NRC, "Request for Additional Shipments in the Model No. GE-100 Package, Certificate of Compliance of Compliance No. 5926", Dated March 1, 2010.
- 3) NRC Letter to Mr. Donald R. Krause, "GEH, Request for Additional Information for Review of the Model No. GE-100 Package Limited Authorization", Dated March 15, 2010.
- 4) NRC Letter to D.R. Krause, GEH, "Revised Authorization for Limited Shipments in the Model No. GE-100 Package, Certificate of Compliance No. 5926", Dated April 6, 2010.

Dear Ms. Sampson:

GE - Hitachi Nuclear Energy Americas, LLC ("GEH") with operations at the Vallecitos Nuclear Center (VNC), Sunol, California holds Certificate of Compliance No. 5926, which expired on October 1, 2008. On January 16, 2009, the NRC authorized a total of eight additional radioactive materials shipments, through December 31, 2010, subject to the conditions delineated in Certificate No. 5926 (Ref. 1). On March 1, 2010, GEH submitted a request (Ref. 2) for the addition of twelve Mo-99 byproduct shipments and the extension of the expiration date of the limited authorization for the Model 100 Package from December 31, 2010 to June 30, 2011.

*Handwritten signature: NMS24*

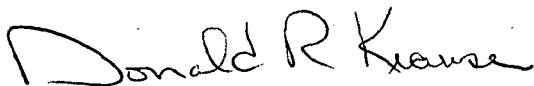
This letter addresses the Staff's Request for Additional Information (Ref. 3), information required by the Staff in its review of GEH's application to add twelve Mo-99 byproduct shipments and to amend the expiration date of the current NRC limited authorization (Ref. 4) for the Model 100, Certificate No. 5926.

In addition, GEH respectfully requests to add to our limited authorization for the Model 100 (Ref. 4) four additional Co-60 byproduct shipments (meeting the requirements of special form radioactive material) to Burlington, Massachusetts. GEH will be the shipper of record and all Co-60 shipments shall originate from GEH's Vallecitos Nuclear Center, Sunol, California. If approved, the number of authorized Co-60 byproduct shipments will increase from four to eight shipments. The Co-60 shipments shall comply with Certificate No. 5926 and applicable Department of Transportation (DOT) regulations

Please note that GEH does not request any changes to the Package design nor previously authorized contents, and that GEH will continue to maintain the Packages in accordance with the maintenance and operating procedures on file with the NRC through the extended time period requested. Further, GEH understands that this request will not be considered a form of certificate renewal, either under 10 CFR 71.38 or any other NRC regulation.

Should the Staff has any questions regarding this submittal, please contact me or Mr. Carlos Martinez at (925) 862-4481.

Sincerely,



Donald R. Krause  
Mgr., Regulatory Compliance & EHS

Docket No. 71-5926  
TAC No. L24430

cc: Gaby Francis (GEH)  
Andrew Langston (GNF-A)  
Carlos Martinez (GEH)  
Louis Quintana (GEH)  
Michael Schrag (GEH)  
David Turner (GEH)

GEH's Response to Request for Additional Information

(Docket No. 71-5926 and TAC No. L24426)

Certificate of Compliance No. 5926

Model No. GE-100

The following addresses the Staff's Request for Additional Information (RAIs), information required by the Staff in its review of GEH's application to amend the limited authorization for the Model GE-100 Package, Certificate No. 5926, in accordance with NRC Regulatory Issue Summary 2008-18, specifically, the addition of twelve Mo-99 byproduct shipments and the extension of the expiration date of the limited authorization for the Model 100 Package from December 31, 2010 to June 30, 2011

RAI 1.1      Provide a detailed description of the proposed molybdenum-99 contents.

The application identifies the radionuclide, but does not provide sufficient information for staff to confirm that the proposed contents are within the contents authorized by CoC No. 5926. The application should include details such as the maximum activity, the chemical and physical form, maximum weight, and decay heat.

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

Response      The molybdenum-99 contents will be in solid metal form; each piece will be of right circular cylinder geometries, nominally, 1 to 1.5-inch diameter by 0.08-inch thick. The material will be natural (elemental) molybdenum metal machined to the above-mentioned geometry which has been irradiated in a research and test reactor. The solid metal pieces will always have at least one dimension greater than 0.2-inch.

The maximum weight of molybdenum to be transported is 6.25 lb per shipment.

The maximum activity per Mo-99 shipment shall be limited to less than 81,000 Curies, to ensure compliance with the Model 100 Certificate decay heat limit of 400 Watts. The typical Mo-99 plan shipment will be approximately 10,000 Ci.

The following summarizes the analysis to determine the number of curies of Mo-99 that can be shipped in the Model 100 Package, with a thermal limit of 400 Watts.

### Methodology

ORIGEN-ARP was utilized to determine the total system decay heat in Watts per curie of Mo-99. (ORIGEN-ARP is a point depletion code developed by Oak Ridge National Laboratory used to solve the rate equations that describe nuclide generation, depletion, and decay processes.) In the analysis, an input was generated that tracked 1 curie of Mo-99 through its decay life. A time period long enough to ensure Mo-99 had reached equilibrium with Tc-99m was considered. The decay heat and curie values during this equilibrium phase were then utilized to calculate an appropriate Watt/Ci value for the system. This value was then used to determine the number of curies of Mo-99 needed to generate 400 W of decay heat.

### Assumptions

The Mo-99 being shipped is in equilibrium with Tc-99m. It is conservative to assume that Tc-99m is in equilibrium with Mo-99 for this calculation, as it will result in the maximum total decay heat per curie of Mo-99 present. Tc-99 has an insignificant total decay heat contribution compared to Mo-99, further, for shipping considerations, the only source of Tc-99 is through the decay of Mo-99.

### Results

The analysis demonstrated that 81,000 Curies of Mo-99 would generate slightly less than 400 Watts of decay heat.

Based on a typical 10,000 Ci Mo-99 shipment, the surface dose of the Model 100 Cask is calculated to be less than 10mR/hr using Rad-Pro. This analytical model did not take into account the use of approved shielded lead liners nor the additional distance and shielding contribution from the Model 100 over-pack assembly.

The Mo-99 shipments will comply with applicable Department of Transportation (DOT) regulations.

The Model 100 Package will be maintained, handled and prepared for shipment in accordance with the maintenance and operating procedures on file with the NRC through the time period requested.

RAI 1.2 Confirm that GEH will be the shipper of each of the requested twelve shipments.

Currently, the application requests twelve shipments, with multiple origin and destination points. GEH must specify that they will be the shipper for each shipment requested in this application. If an entity other than GEH will make any of the shipments associated with this application, those should be removed from this application and a separate application should be developed. Only the addressee of the limited authorization letter may use the approval to make shipments.

This information is required to assess compliance with 10 CFR 71.31.

Response GEH will be the shipper for each of the twelve Mo-99 shipments requested, regardless of origin of shipment.

RAI 1.3 Revise the justification for continued use of the package to address all potential Reasons for Requesting Extended Use.

The only justification provided in the application, "Reasons(s) for Requesting Additional Extended Use," is that GEH will not be able to deliver on customer deliverables, resulting in significant costs and program delays. Additionally, there is a reference to the justification for SNM shipments previously provided by the GEH application dated September 29, 2008. This application is for transport of molybdenum-99, not SNM.

The application should address the availability of alternative domestically approved packaging, and the potential for the contents to be reconfigured such that transport can be conducted in accordance with the regulations (to include reducing nominal form contents to Type A quantity), RIS 2008-18. Requested information items 3(a) and (b). The application should also describe why the transport schedule cannot be delayed until a package meeting the regulations is available for use, RIS 2008-18. Requested information item 3(c). The application should detail any adverse impacts that will result if the shipment is not conducted as requested.

This information is required to assess compliance with 10 CFR 71.31.

Response The use of a Type B package will allow the Molybdenum-99 Demonstration Project, currently being performed pursuant to a Cooperative Agreement with

the U.S. Department of Energy, to utilize existing facilities for post-irradiation processing of irradiated molybdenum material. The post-irradiation processing allows the technology development portion of the program to proceed at a reasonable rate to further vet the technology and support the development of commercial facility conceptual design to support the Cooperative Agreement objective of developing a domestic supply of this vital medical isotope. Should a Type B package not be available, significant schedule delay will be incurred to establish appropriate facilities in which to conduct testing. The schedule for establishing these facilities is not currently in the project scope and will add significant delay when compared to shipping the material to a facility that is already setup to receive the material.

The GEH team has completed an exhaustive search of licensed Type B containers published by the NRC (NUREG-0383) and on the RAMPAC website. Additionally, the team consulted with Oak Ridge National Laboratory staff supporting the project as to any currently available options. After reviewing these materials and consulting with these entities, the team could not find a currently licensed cask where the Mo-99 material met the contents requirements and the weight/size of the cask was within the size acceptable by the destination location(s).

If the shipment were to be completed using Type A quantities, GEH would have to ship many (upwards of 50-100) Type A containers. This large number of containers would be a significant undertaking when considering the added cost of the containers, logistics of packing, and shipping the containers. Additionally the origin and destination locations are not equipped to handle that many containers simultaneously.

If the material were left to decay to Type A quantities the project team would not be able to proceed with some of the scheduled tests. These tests will allow the project team to retire several higher-level risks.

In regards to SNM shipments, it is understood from the latest NRC authorization for limited shipments, dated April 6, 2010, that GEH is not presently authorized to ship SNM shipments using the Model 100 Package.

RAI 1.4      Provide the details of the plan and schedule to acquire replacement packages.

The applicant must provide the details of the plan and schedule to develop a replacement package for molybdenum-99 contents. The limited authorization is not intended to allow business as-usual in expired packaging. Staff must

have reasonable assurance that the applicant is making progress toward use of a packaging which meets the regulatory requirements. As identified in RIS 2008-18, the plan and schedule to acquire replacement packages should include key milestones and proposed implementation dates. The referenced "AOS" package is currently under review for special form contents only. The applicant should provide more detail regarding their schedule to develop and submit an application or amended request.

This information is required to assess compliance with 10 CFR 71.31.

**Response** In February 2005, GEH entered into a contract with Alpha-Omega Services Inc. ("AOS") to design and license a suite of Type B Transport Packaging Systems. These AOS Packagings are possible replacements for the Model 100 (and the Model GE-1500) Package, on a lease or for purchase basis, first quarter of calendar year 2011.

The following table summarizes the activities completed and/or in-progress as they pertain to the AOS Type B Transport Packaging Systems licensing (and manufacturing) efforts. In short, the AOS design and licensing team is in the process of preparing RAI responses and revising the applicable Safety Analysis Report. In an effort to streamline and expedite the submittal, review and approval processes, the current AOS application is for byproduct source material in special form and specifically excludes Special Nuclear Material for the time being.

GEH is also exploring the use of its international competitor's Type B Packages to transport Mo-99 in solid form, which preclude their use domestically; therefore, this approach would require re-licensing the competitor's Type B packaging in the U.S. with no guarantees of securing the required certification in a timely manner to support the Molybdenum-99 Demonstration Project.

ACTIVITY	STATUS	SCHEDULED MILESTONE	COMPLETION DATE
Design	The AOS Package design was completed and submitted to the NRC in Oct. 2007. Comments received from the NRC on Feb. 2008 did not have any impact on the design. The only design characteristic impacted was the material section for the elastomeric seals	Oct. 1, 2007	Oct. 1 2007
Testing	All required testing were completed for the Oct. 2007 NRC submittal. The NRC did not identify any additional testing in their comments received Feb. 2008.	Mar. 30, 2007	Mar. 30, 2007
Application	The AOS Package Safety Analysis Report (SAR) was re-submitted to the NRC on June 22, 2009. This submittal excludes Special Nuclear Material from the proposed contents and includes only by-product source material.  An updated SAR, Rev. C, was submittal on Sept. 15, 2009 that addressed initial NRC RSIs. Follow-up work is in progress to address NRC RAIs and SAR revisions.	Nov. 1, 2008	Jun. 22, 2009  Sept. 15, 2009
Certification	Certification is expected nine (9) months to a year from the SAR submittal date.	June 2010	---
Production	According to AOS, initial Package production is expected to take 8 months. AOS plans to make a decision to commit for production as soon as there is any indication that the Package design will be licensed by the NRC.	July 2010	---
Completion	Availability of the AOS Packaging to GEH is not expected until first quarter 2011.	---	1 <sup>st</sup> Qtr. 2011





# SHIPPING NOTICE

(STARRED SPACES TO BE FILLED IN BY M/S)

No. 2061578

CUSTOMER'S  
ORDER NO.

INVOICE NO.

DATE

DATE

I.R. NO.

(TYPE SYMBOL I.R.)

S. N. NO.

(TYPE SYMBOL S.N.)  
M/S \*

PLEASE SHOW ABOVE S.N. NO. ON ALL  
CORRESPONDENCE AND CREDITS  
RELATING TO THIS SHIPMENT.

CHARGE  
TO

U.S. NUCLEAR REGULATORY COMMISSION

WASHINGTON DC 20555-001

ATTN: DOCUMENT CONTROL DESK/MICHELE SAMPSON

SHIP TO

MARKS-SEE NOTE  
UNDER INSTRUCTIONS

04-14-10

VAL NUC CTR

PPD.

DATE SHIPPED \*

FROM \*

PPD. OR  
COLL. \*

CAR INITIALS & NO. \*

FED EX

F.O.B.

HOW SHIPPED  
& ROUTE \*

ACCOUNTING DISTR.

TERMS

## INTERNAL INSTRUCTIONS

Mark packages with S.N. No., also with I.R.  
No. or Customer's Order No. if either appears  
on this shipping notice.

Show the S.N. No. and Customer's Order No.  
(if any) on all correspondence.

Invoice Number and Date to be filled in by  
Accounting.

PACKAGE NUMBERS *	QUANTITY	DESCRIPTION	SPACE BELOW FOR ACCTG. USE ONLY		
			PRICE	AMOUNT	CLASS
	1 LETTER	DONALD KRAUSE, GEH, TO MICHELE SAMPSON, NRC, "RAIS RESPONSES FOR REVIEW OF THE MODEL NO GE 100 PACKAGE "LIMITED AUTHORIZATION", DATED APRIL 14, 2010  NON-HAZARDOUS SHIPMENT  CHARGE 169063 TASK 1  DELIVERY			
SHIP VIA FED EX			INDIVIDUAL REQUESTING SHIPMENT C. MARTINEZ		

SEND COPY  
OF E/R OR S/L TO

CHARGE  
MATERIAL TO

COPY  
M/S TO

INCOMING  
TRANS. TO

INDICATE INFORMATION BY AN "X"

OUTGOING  
TRANS. TO

PROPERTY  
CUSTOMER

REJECTED  
MATERIAL

SALE

FOR TRIAL  
TO BE RETURNED: YES NO

BOXING TO

COPIES OF  
S/N TO

DATE ISSUED

04-14-10

DEPT.

VALLECITOS NUCLEAR CENTER, SUNOL CA. 94586

LOCATION

AUTHORIZED SIGNATURE

*Sam I. Mahoney*

BY

FF-497 (5-SHTS.) 5-65 PTG. 6-88

(2) SHIPPING  
BILLING COPY OF SHIPPING NOTICE