UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 29, 2014

Mr. Tom A. Caine
Site Manager
Vallecitos Nuclear Center
6705 Vallecitos Road
Sunol, California 94586

SUBJECT: REVISION NO. 26 OF CERTIFICATE OF COMPLIANCE NO. 9228 FOR THE MODEL NO. 2000 PACKAGE (TAC NO. L24690) AND CLOSEOUT OF CONFIRMATORY ACTION LETTER NMSS-2012-001

Dear Mr. Caine:

By letter dated October 10, 2012, supplemented on July 1, 2013, November 15, 2013, November 22, 2013, and November 27, 2013; you requested an amendment to Certificate of Compliance No. 9228. On the basis of its technical review of the submittals, NRC staff is issuing Certificate of Compliance No. 9228, Revision No. 26, for the Model No. 2000 transportation package, enclosed. This revision of the certificate provides a more restrictive authorization as it relates to the contents of the permitted nuclides: it removes the optional lead liner configuration and reduces the allowed gamma emitting nuclides to 137Cs, 60Co, 181Hf, 90Sr/Y, and 95Zr/Nb, in configurations and quantities which the staff finds to be properly demonstrated to give reasonable assurance of public health and safety. The use of the lead liner was the main subject of Confirmatory Action Letter (CAL) NMSS-2012-001. You will receive further information regarding the CAL by separate correspondence.

Changes made to the enclosed certificate are indicated by vertical lines in the margin. The staff's safety evaluation report is also enclosed.

Those on the attached list have been registered as users of the package under the general license provisions of 10 CFR 71.17 or 49 CFR 173.471. The approval constitutes authority to use the package for shipment of radioactive material and for the package to be shipped in accordance with the provisions of 49 CFR 173.471.

Upon removal of Enclosure 3, this document is uncontrolled

If you have any questions regarding this certificate, please contact me or John Vera of my staff at (301) 287-9165.

Sincerely,

/RA/

Timothy Lupold, Acting Chief
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-9228
TAC No. L24690

Enclosures:
1. Certificate of Compliance No. 9228, Rev. No. 26
2. Safety Evaluation Report
3. Registered Users List

Upon removal of Enclosure 3, this document is uncontrolled

cc w/encls 1 & 2:
R. Boyle, Department of Transportation
J. Shuler, Department of Energy c/o L.F. Gelder
Registered Users

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OFC:	SFST	SFST	SFST	SFST	SFST	SFST
NAME:	JVera	MDeBose	VWilson	RTorres	DTang	ELove
DATE:	7/29/2014	8/13/2014	7/30/2014	7/30/2014	8/12/2014	7/30/2014
OFC:	SFST	SFST	SFST	SFST		
NAME:	JSmith for MRahimi	DTarantino for ACsontos	SKoenick	TLupold		
DATE:	8/15/2014	8/21/2014	8/21/2014	8/29/2014		

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UNITED STATES
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SAFETY EVALUATION REPORT

Docket No. 71-9228
Model No. 2000
Certificate of Compliance No. 9228, Rev. No. 26

SUMMARY

A series of events and interactions with the NRC regarding the Model No. 2000 led General Electric Hitachi (GEH) to submit an October 10, 2012 application for amendment of the certificate of compliance (CoC). After consideration of the information provided by the applicant in the application, supplements, public meetings, and letter authorization requests, staff is issuing CoC No. 9228, Rev. No. 26. The staff is approving configurations and contents that the staff concludes have been demonstrated to meet the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 71. This provides a more restrictive authorization then requested by the licensee.

BACKGROUND

In 2012, events at Clinton and Hope Creek led staff to re-evaluate the design, in particular the adequacy of shielding, potentially inadequate design control, and the CoC for the Model No. 2000 package. On July 23, 2012, NRC staff issued a request for information (Reference 1) in order to evaluate potentially safety-significant issues pertaining to the shielding evaluation for package contents below 600 watts, the use of the optional shielding liner without the shield lid, issues related to the variable shield thickness of the barrel racks, the configuration and shielding specifications for Co-60 sources above 600 watts, and the overall evaluation of allowable package contents. GEH indicated by an August 6, 2012 email (Reference 2) and letter dated August 21, 2012 (Reference 3), that they had issued a management directive to suspend use of the Model No. 2000 package with the optional lead liner configuration until the NRC questions regarding the liner shipping configuration were resolved. The NRC issued a Confirmatory Action Letter (CAL) to this effect on September 21, 2012 (Reference 4).

By letter dated October 10, 2012, GEH responded to the July 23, 2012, request for information and requested an amendment to CoC No. 9228 for the Model No. 2000 package (Reference 5). Staff issued a request for additional information (RAI) in connection with the review of the amendment request on December 17, 2012 (Reference 6). GEH responded to both the RAI and the CAL on July 1, 2013 (Reference 7). Staff issued a second round of RAI on September 18, 2013 (Reference 8), to which GEH provided responses on November 15 and 22, 2013 (References 9 and 10).

In order to support shipping needs, GEH requested a special authorization for one shipment on November 27, 2013 (Reference 11). NRC authorized the shipment on December 31, 2013 and extended the authorization on January 17, 2014 (References 12 and 13).

By letter dated January 24, 2014 (Reference 14), GEH requested a meeting with the NRC to discuss resolution of issues to allow ongoing uses of the Model No. 2000 for transport beyond the one-time NRC special authorization. The meeting was conducted on February 12, 2014 (Reference 15). GEH presented to NRC on their expected near term shipping needs (see Reference 16). GEH expressed concern about the uncertainty of these shipments in light of the current amendment review for the Model No. 2000 package and the previous issues that GEH had been addressing. NRC staff stated that these shipments could be licensed by special authorizations, for specific contents and configurations as long as appropriate analyses demonstrating safety are included. NRC also stated that GEH should demonstrate effort in producing a consolidated safety analysis report (SAR) that demonstrates compliance to safety regulations according to the design for all desired contents, including bounding safety analyses and classifications of important to safety components. GEH stated that the submittal of such a consolidated SAR is targeted for mid-2015. For the current amendment being reviewed, NRC staff stated that the CoC would be issued for the quantity of contents supported by the analyses supplied so far. GEH stated they agreed with this approach since they would support near-term needs with special authorization requests.

CoC No. 9228 has been amended to authorize shipment of revised quantities of byproduct, source, or special nuclear material in solid form, with gamma emitting nuclides limited to the following isotopes: ^{137}Cs, ^{60}Co, ^{181}Hf, ^{90}Sr/Y, and ^{95}Zr/Nb. As requested by GEH in Reference 7, the lead liner and lid configuration as an option are removed as a configuration for the Model No. 2000, and Ir-192 is deleted from the authorized contents of Section 5(b)(1)(ii). For transport of ^{60}Co, the configuration requested by GEH in Reference 11 is incorporated into the CoC. Based on the statements and representations in the application, as supplemented, the staff concludes that with the effected changes, the package meets the requirements of 10 CFR Part 71.

EVALUATION

Structural/Materials

Staff previously evaluated the configuration being approved in Revision No. 26 of the CoC for a special authorization (Reference 12).

After evaluation of the analysis and drawings submitted in Reference 7, the staff determined that GEH had not provided reasonable assurance that the material basket (Drawing No. 183C8356, Rev. 3) would be able to withstand the hypothetical accident condition drops specified in 10 CFR 71.73(c)(1). More specifically, GEH had not provided a proper shear stress analysis to prove that the dowel pin supporting the tungsten plug of the material basket would not fracture resulting in a loss of shielding at the bottom of the source. GEH designed a basket support as an additional shoring component for the material basket. The basket support would geometrically and structurally prevent the bottom tungsten plug from exiting the barrel rack during all transport conditions assuming all non-important to safety (ITS) welds and components were to fail.

As part of the special authorization request in Reference 11, GEH provided a structural and geometric analysis for a material basket support (Drawing No. 000N2016, Rev. 0). GEH assumed the most severe hypothetical accident conditions (HAC) conditions: (1) a bottom drop orientation imparting the highest stress on the basket support, (2) a high accident temperature (400°F), and (3) failure of supporting non-ITS welds. GEH demonstrated a safety factor of greater than 10 under these compressive stress conditions. Buckling was ruled out as a

potential failure mode since the basket support is recessed within the barrel rack and is short relative to its diameter. GEH also calculated a 10^{-4} probability for the basket support exiting the barrel rack during HAC. Their analysis also showed a 10^{-4} probability that the increased basket height would interfere with cask lid closing. The staff considers these analyses as defense in depth complements to previous analysis by GEH, in which the arms of the barrel rack are assumed to fail, essentially rendering them non-ITS. With these demonstrations, staff has reasonable assurance that the package maintains structural integrity under normal conditions of transport and HAC.

Based on the information provided by the applicant and safety evaluation performed by the staff, the staff concludes that the Model No. 2000 package meets the regulatory requirements of 10 CFR Part 71.

Shielding

Rev. 25 of the CoC (Reference 17) specifies the following contents in condition No. 5.(b)(1)(ii) *"Byproduct, source, or special nuclear material in solid form."* The quantities of this material are limited in Section 5(b)(2)(ii), which states: *"For the contents described in 5(b)(1)(ii): 2000 watts decay heat. Fissile contents not to exceed 500 grams U-235 equivalent mass. Carrier racks specified in 5(a)(3)(iv) or 5(a)(3)(v) must be used for contents exceeding 600 watts decay heat per package."*

According to the information submitted by the applicant as discussed in the Background section of this safety evaluation report, the staff is removing the lead liner component from the CoC and referencing updated drawings of the carrier racks as well as specifying the nuclides and configurations that are currently supported by analyses submitted to the NRC. This evaluation applies to the gamma emitting nuclides specified in Condition No. 5(b)(1)(ii) of the CoC. The allowed nuclide quantities and configurations are based on staff confirmation that they were bounded by previously reviewed SARs on record as well as the information in recent submittals by GEH. Other proposed configurations that were under review by NRC staff are not approved in the CoC and not discussed in this SER because sufficient information was not provided by the applicant for staff to reach a regulatory finding.

NRC has informed GEH of the limits to these nuclide quantities and shielding configurations being applied in the CoC (References 7 and 18). The bases of these nuclide quantities and shielding/shoring configuration are listed below. The approval for the nuclides assumes they are not mixed in a single package (only one nuclide type per package), except the quantity of ^{60}Co which is allowed to have a concurrent amount of ^{95}Zr/Nb equal to 100 Ci:

^{137}Cs	422,000 Ci	Reference 19
^{60}Co	7,000 Ci	Reference 12
^{181}Hf or ^{90}Sr/Y	456,000 Ci for ^{181}Hf 596,000 Ci for ^{90}Sr/Y	Reference 19
^{95}Zr/Nb	100 Ci	Reference 12

In addition to the modifications to the allowable contents discussed above, the staff is also modifying Condition No. 16 of the CoC. This condition previously allowed transport of the Model No. 2000 in a horizontal configuration for contents 5(b)(1)(i) and 5(b)(1)(ii). These contents were only allowed to be shipped in the horizontal configuration with the presence of the lead

liner. Since the lead liner is being removed from the CoC, this condition is modified to delete the contents that are no longer authorized to be shipped horizontally.

Based on the above considerations and additional requirements, the staff concludes that the Model No. 2000 package meets the regulatory requirements of 10 CFR Part 71.

CONDITIONS

The conditions specified in the certificate of compliance have been revised to incorporate several changes as indicated below:

Condition No. 5.(a)(2) has been updated to eliminate mention of lead liner, simplify the description, and use the correct term "package."

Condition No. 5.(a)(3) has been updated to reference updated and new drawings.

Condition No. 5(b)(1)(ii) has been updated to read: *"Byproduct, source, or special nuclear material in solid form. Gamma emitting nuclides are limited to the following isotopes: ^{137}Cs, ^{60}Co, ^{181}Hf, $^{90}Sr/Y$, and $^{95}Zr/Nb$."*

Condition No. 5(b)(2) has been updated to delete mention of the lead liner.

Condition No. 5(b)(2)(ii) has been updated to read: "*2000 watts decay heat. Fissile contents not to exceed 500 grams U-235 equivalent mass. A single package shall not mix nuclides except as allowed below. Quantities and minimum shielding and shoring requirements for isotopes listed in Condition No. 5(b)(1)(ii) of gamma emitting nuclides are specified as follows:*

^{137}Cs	*422,000 Ci. Source must be divided in two, each source not exceeding 211,000 Ci, and placed into the "two-tier" option of the multifunctional rack described in 5(a)(3)(iv). The top source must be shielded on the bottom by a 1" thick steel end plug and a minimum of 2.375" of steel from the plates in the top and bottom sections of the multifunctional rack. The bottom source must also be shielded on the bottom by a 1" end plug and an additional minimum 1.375" of steel.*
^{60}Co	*7,000 Ci, with a maximum of 100 Ci Zr/Nb-95. The two separators and basket filler described in 5(a)(3)(ix) shall be used, stacked inside of the material basket described in 5(a)(3)(vi). The material basket shall be inside of the barrel rack described in 5(a)(3)(v). A basket support, as described in 5(a)(3)(x), shall be used to hold up the shield plug and material basket inside the barrel rack.*
^{181}Hf, or $^{90}Sr/Y$	*456,000 Ci for ^{181}Hf. 596,000 Ci for $^{90}Sr/Y$. Multifunctional rack as described in 5(a)(3)(iv) shall be used for either.*
$^{95}Zr/Nb$	*100 Ci. The configuration specified for ^{60}Co, or the multifunctional rack as described in 5(a)(3)(iv), shall be used.*

Condition No. 9(a)(i) now spells out "standard pressure and temperature" instead of "STP."

Condition No. 16 has been updated to remove the option of horizontal transport for contents that relied on the lead liner configuration.

Condition No. 17 has been updated to delete package marking requirements that are no longer applicable.

Condition No. 20, which allowed use of Revision No. 24 of the certificate, has been deleted. The new Condition 20 has been added to require a consolidated application for renewal of the certificate.

The References section has been updated to include the supplements submitted by GEH in the course of the review leading to this amendment.

CONCLUSION

CoC No. 9228 has been amended to authorize shipment of revised quantities of byproduct, source, or special nuclear material in solid form, with gamma emitting nuclides limited to the following isotopes: ^{137}Cs, ^{60}Co, ^{181}Hf, ^{90}Sr/Y, and ^{95}Zr/Nb. The lead liner and lid configuration is removed as an option for the Model No. 2000, and ^{192}Ir is deleted from the authorized contents of CoC Section 5(b)(1)(ii). For transport of ^{60}Co, the configuration previously requested by GEH in Reference 11 and approved by NRC in Reference 12 is incorporated into the CoC. Based on the statements and representations in the application, as supplemented, the staff concludes that that with the effected changes, the package meets the requirements of 10 CFR Part 71.

Issued with Certificate of Compliance No. 9228, Revision No. 26.

REFERENCES

1. Letter from M. D. Lombard (NRC) to D. R. Krause (GEH), “Request for Information for Continued Use of the Model No. 2000 Package, Certificate of Compliance No. 9228,” July 23, 2012 (ADAMS Accession No. ML12205A258).

2. Email from C. Martinez (GEH) to P. Saverot (NRC), “Model 2000 Type B Package (CoC 9228),” August 6, 2012 (ADAMS Accession No. ML122270431).

3. Letter from D. R. Krause (GEH) to P. Saverot (NRC), “Response Extension to NRC Request for Information for the Model No. 2000 Package, Certificate Of Compliance No. 9228, Docket No. 71-9228.” August 21, 2012 (ADAMS Accession No. ML12234A691).

4. Letter from M. D. Lombard (NRC) to D. R. Krause (GEH), “Confirmatory Action Letter (CAL) No. NMSS-2012-001,” September 21, 2012 (ADAMS Accession No. ML12269A255).

5. Letter from A. McFadden (GEH) to M. D. Lombard (NRC), “GEH Response to Request for Information for Continued use of the Model No. 2000 Package, Certificate of Compliance No. 9228, Docket 71-9228, TAC LA0129.” October 10, 2012 (ADAMS Accession No. ML12286A039).

6. Letter from P. Saverot (NRC) to D. R. Krause (GEH), “Request for Additional Information for the review of the Model No. 2000 Package.” December 17, 2012 (ADAMS Accession No. ML12352A263).

7. Letter from A. McFadden (GEH) to M. D. Lombard (NRC), “GEH Response to Confirmatory Action Letter NMSS-2012-001 and requests regarding the GE2000 Type B

Shipping Cask, Certificate 9228, Docket 71-9228, TAC Nos: LA0129 and L24690," July 1, 2013 (ADAMS Accession Nos. ML13182A700 and ML13197A396).

8. Letter from P. Saverot (NRC) to D. R. Krause (GEH), "Second Request for Additional Information for the review of the Model No. 2000 Package." September 18, 2013 (ADAMS Accession No. ML13266A413).

9. Letter from T. Caine (GEH) to P. Saverot (NRC), "GEH Response to Second Request for Additional Information for the Review of the Model No. 2000 Package, Docket No. 71-9228, TAC No. L24690," November 15, 2013 (ADAMS Accession No. ML13322A444).

10. Letter from T. Caine (GEH) to P. Saverot (NRC), "GEH Response to Second Request for Additional Information for the Review of the Model No. 2000 Package, Docket No. 71-9228, TAC No. L24690," November 22, 2013 (ADAMS Accession No. ML13329A228).

11. Letter from T. Caine (GEH) to NRC, "GEH Request for Special Authorization to Use the Model No. 2000 Package, Docket No. 71-9228," November 27, 2013 (ADAMS Accession Nos. ML13344A978 and ML13344A979).

12. Letter from M. Sampson (NRC) to T. Caine (GEH), "Special Authorization for shipment using the Model No. 2000 Package (TAC No. L24861)," December 31, 2013 (ADAMS Accession No. ML13365A138).

13. Letter from M. Sampson (NRC) to S. Murray (GEH), "Request to extend special authorization for one time shipment (TAC No. L24877)." January 17, 2014 (ADAMS Accession No. ML14017A421).

14. Letter from S. Murray (GEH) to NRC, "GEH/NRC Management Meeting Request to Discuss Model 2000 Package." January 24, 2014 (ADAMS Accession No. ML14024A430).

15. Memorandum from J. Vera (NRC) to T. Hsia (NRC), "Summary of February 12, 2014, Meeting with General Electric-Hitachi Nuclear Energy." March 20, 2014. (ADAMS Accession No. ML14083A566).

16. Email Chain between J. Vera (NRC) and GEH, "GEH GE 2000 Letter Authorization Requests." May 14, 2014 to May 22, 2014 (ADAMS Accession No. ML14148A000).

17. Letter from M. Waters (NRC) to D. R. Krause (GEH), "Revision No. 25 of Certificate of Compliance No. 9228 for the Model No. 2000 Package," May 4, 2011 (ADAMS Accession Nos. ML111240595 and ML11200A101).

18. Letter from M. Sampson (NRC) to D. Krause (GEH), "New Conditions of Certificate of Compliance No. 9228 for the Model No. 2000 Package," January 3, 2013 (ADAMS Accession No. ML13003A169).

19. Enclosure 2 ("Approval Record") to letter from C. Chappell (NRC) to G. Cunningham (General Electric Company), "Transmittal of Certificate of Compliance No. 9228, Revision No. 8." September 15, 1995 (ADAMS Accession No. ML030860096).