



Global Nuclear Fuel

A Joint Venture of GE, Toshiba, & Hitachi

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July 31, 2007

John R. Wray
Project Manager,
Division of Spent Fuel Storage & Transportation
Office of Nuclear Materials Safety & Safeguards
U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Subject: Supplement to GNF-A Response to RAI for NPC Shipping Package dated 1/26/07

Reference: (1) NRC CoC No. 9294, Docket 71-9294 (TAC L24033)
(2) Letter, S.P. Murray to Director, SFPO, 10/3/06
(3) NRC Request for Additional Information (RAI), 1/26/07
(3) GNF-A Response to NRC RAI, 4/27/07
(4) NRC Summary of 6/11/07 Meeting with GNF-A, 6/18/07

Dear Mr. Wray:

Global Nuclear Fuel - Americas, LLC (GNF-A) facility in Wilmington, N.C. appreciates the NRC DSFST staff's ongoing efforts to review and approve our requested update to Certificate of Compliance No. 9294 (References 1 & 2).

Per your request during our June 11, 2007 meeting, GNF-A is providing additional information addressing the differences between the IAEA 1985 and 1996 standards and is providing a clarification regarding the amounts of dunnage added to partial load shipments as shown in Attachment 1.

Our evaluation of the IAEA standard differences and partial load shipment information are attached. In addition, our review of these differences identified an omission in our October 3 2006 CoC update request. Three pages from Chapter 1, Section 1.1, Chapter 6, Sections 6.1 and 6.6.5 of the Safety Analysis Report (SAR) have been revised to incorporate the corrected Criticality Safety Index (CSI) nomenclature which has replaced the Transport Index (TI) as described in issue 5. These revised pages to the SAR are shown in Attachment 2.

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Please contact me on (910) 675-5950 or Phil Ollis on (910) 675-6301, if you have any questions or would like to discuss this matter further.

Sincerely,

ORIGINAL SIGNATURE ON FILE

Scott P. Murray, Manager
Licensing & Liabilities COE

Attachments

cc: SPM 07-034

ATTACHMENT 1

**NRC Request for Additional Information to Address the Difference
between the IAEA 1985 and 1996 Standards**

NRC Request for Additional Information to Address the Differences between the IAEA 1985 and 1996 Standards (Federal Register Notice Vol. 69, No. 16)

- Issue 1, Changing Part 71 to the International System of Units (SI) only.

The NRC has decided to continue using the dual-unit system (SI units and customary units) in Part 71. Therefore, no changes are needed in the package application or the Certificate of Compliance (CoC) to conform to the new rule.

- Issue 2, Radionuclide Exemption Values.

The final rule adopts, in §§ 77.14, 71.88 and Appendix A, Table A-2, the radionuclide activity concentration values and consignment activity limits in TS-R-1 for the exemption from regulatory requirements for the shipment or carriage of certain low-level materials. In addition, the final rule provides an exemption from regulatory requirements for natural material and ores containing naturally occurring radionuclides that are not intended to be processed for the use of these radionuclides.

This revision does not affect the Model No. NPC package based on the designed purpose of the Model No. NPC package and allowed contents specified in the package certificate. Therefore, no changes are needed in the package application or the Certificate of Compliance (CoC) to conform to the new rule.

- Issue 3, Revision of A_1 and A_2 .

The final rule adopts, in Appendix A, Table A-1 of part 71, the new A_1 and A_2 values from TS-R-1, except for molybdenum-99 and californium-252. The final rule does not include A_1 and A_2 values for the 16 radionuclides that were previously listed in part 71 but which do not appear in TS-R-1. The A_1 and A_2 values were revised by IAEA based on refined modeling of possible doses from radionuclides.

The authorized contents of the Model No. NPC package are limited to type A quantity uranium in the form solid uranium oxides. The A_2 value for uranium enriched to 5 weight percent uranium-235 did not change in the new rule, and is unlimited. Therefore, no changes are needed in the package application or the Certificate of Compliance (CoC) to conform to the new rule.

- Issue 4, Uranium Hexafluoride (UF_6) Package Requirements.

The final rule provides, in new § 71.55(g), a specific exception for certain uranium hexafluoride (UF_6) packages from the requirements of § 71.55(b).

The Model No. NPC package is not a uranium hexafluoride (UF₆) package. Therefore, no changes are needed in the package application or the Certificate of Compliance (CoC) to conform to the new rule.

- Issue 5, Introduction of the Criticality Safety Index (CSI) Requirements.

The final rule adopts the TS-R-1 (paragraphs 218 and 530).

Chapters 1, Section 1.1 and Chapter 6, Sections 6.1 and 6.6.5 of the Safety Analysis Report (SAR) have been revised to incorporate the CSI nomenclature.

- Issue 6, Type C Packages and Low Dispersible Material.

The final rule does not adopt the Type C or Low dispersible material (LDM) requirements for plutonium air transport as introduced in the IAEA TS-R-1. Therefore, no changes are needed in the package application or the Certificate of Compliance (CoC) to conform to the new rule.

- Issue 7, Deep Immersion Test.

The final rule adopts the requirements for an enhanced water immersion test (deep immersion test), which is applicable to any Type B or C packages containing activity greater than 10⁵ A₂.

The Model No. NPC package is a Type A package and has an activity less than 10⁵ A₂. Therefore, no changes are needed in the package application or the Certificate of Compliance (CoC) to conform to the new rule.

- Issue 8, Grandfathering Previously Approved Packages.

The final rule adopts the following grandfathering provisions for previously approved packages in section 71.13.

This application demonstrates compliance with the final rule. Therefore, grandfathering the design of the Model No. NPC package is not necessary.

- Issue 9, Charges to Various Definitions.

The final rule adopts the TS-R-1 definition of Criticality Safety Index (CSI).

Chapter 6, Criticality Safety Evaluation, Section 6.1 and Section 6.6.5 have been revised to incorporate the CSI nomenclature.

- Issue 10, Crush test for Fissile Material Package Design.

The final rule adopts, in § 71.73, the TS-R-1 requirement for a crush test for fissile material package designs and eliminated the 1000 A₂ criterion, but

maintained the current part 71 testing sequence and drop and crush test requirements. The crush test is required only when the specimen has a mass not greater than 500 kg (1,100 lb).

The Model No. NPC package has a mass of 1,302 kg (2,870 lb) for packaging and contents. Therefore, the requirement to perform a crush test does not apply to the Model No. NPC package. This is documented in Section 2.7.2 of the SAR.

- Issue 11, Fissile Material Package Design for Transport by Aircraft.

The final rule adopts TS-R-1, paragraph 680, Criticality evaluation, in a new § 71.55(f) that only applies to fissile package designs that are intended to be transported aboard aircraft.

The Model No. NPC package is not intended for transport by aircraft. Therefore, no changes are needed in the package application or the Certificate of Compliance (CoC) to conform to the new rule.

- Issue 12, Special Package Authorizations.

The final rule adopts, in § 71.41, special package authorizations that will apply only in limited circumstances and only to one-time shipments of large components.

The provision is not applicable to Model No. NPC package. Therefore, no changes are needed in the package application or the Certificate of Compliance (CoC) to conform to the new rule.

- Issue 13, Expansion of Part 71 Quality Assurance (QA) Requirements to Certificate of Compliance (CoC) Holders.

The final rule adds the terms “certificate holder” and “applicant for a CoC” to subpart H, part 71 and adds a new section, § 71.9, on employee protection.

QA requirements apply to design, purchase, fabrication, handling, shipping, storing, cleaning, assembly, inspection, testing, operation, maintenance, repair, and modification of components of packaging that are important to safety. The certificate holder, Global Nuclear Fuels – Americas, LLC, has a QA program meeting the requirements, as required for the Certificate Holder. The NRC has approved the QA program. Therefore, no changes are needed in the package application or the Certificate of Compliance (CoC) to conform to the new rule.

- Issue 14, Adoption of the American Society of Mechanical Engineers (ASME) Code.

The NRC has decided not to incorporate the ASME Code, section III, division 3 requirements into part 71. Therefore, no changes are needed in the package application or the Certificate of Compliance (CoC) to conform to the new rule.

- Issue 15, Change Authority for Dual-Purpose Package Certificate Holders.

The Commission does not reach a final decision on the issue of change authority for dual-purpose package certificate holders in this final rule. Therefore, no changes are needed in the package application or the Certificate of Compliance (CoC) to conform to the new rule.

- Issue 16, Fissile Material Exemptions and General License Provisions.

The final rule adopts various revisions to the fissile material exemptions and the general license provisions in part 71 to facilitate effective and efficient regulation of the transport of small quantities of fissile material.

The criticality safety of the Model No. NPC package does not rely on limiting fissile materials to exempt or generally licensed quantities. Chapter 6 of the SAR demonstrates criticality safety of the package with the authorized fissile contents. Therefore, no changes are needed in the package application or the Certificate of Compliance (CoC) to conform to the new rule.

- Issue 17, Decision on Petition for Rulemaking on Double Containment of Plutonium (PRM-71-12).

Currently in 10 CFR 71.63(b), plutonium in excess of 0.74 TBq (20 Ci) must be packaged in a separate inner container placed with an outer packaging. The final rule grants the petitioner's request to remove the double containment requirement of § 71.63(b).

The Model No. NPC package is not authorized for the transport of plutonium. Therefore, no changes are needed in the package application or the Certificate of Compliance (CoC) to conform to the new rule.

- Issue 18, Contamination Limits as Applied to Spent Fuel and High-Level Waste (HLW) Packages.

The final rule does not adopt any changes to part 71 for this issue. Therefore, no changes are needed in the package application or the Certificate of Compliance (CoC) to conform to the new rule.

- Issue 19, Modifications of Event Reporting Requirements.

The final rule revises, in § 71.95, the event reporting submission period to provide a written report from 30 to 60 days.

There are no revisions required to this application or the Certificate of Compliance to address this change.

NRC Request for Additional Information regarding the amounts of dunnage added to partial load shipments.

- The Model No. NPC package is loaded so that the contents do not move within the Inner Containment Assembly (ICCA) creating unanticipated dynamic forces. In the case of shipments utilizing a poly bottle, three poly bottles are placed in each ICCA regardless of payload to prevent movement of the bottles within the ICCA.

ATTACHMENT 2

Three (3) revised pages of the Safety Analysis Report (SAR)

Chapter 1, Section 1.1

Chapter 6, Sections 6.1 and 6.6.5

1.0 GENERAL INFORMATION

This chapter of the Global Nuclear Fuel (GNF) New Powder Container, Model No. NPC (Patent #6,166,391), Safety Analysis Report presents a general introduction and description of the NPC. The major components comprising the NPC are presented in Figures 1.1-1, 1.1-2, and 1.1-3. Figure 1.1-1 presents an exploded view of all major NPC packaging components. Figure 1.1-2 illustrates details of the outer closure region. Figure 1.1-3 presents a detailed view of the inner containment canister and its closure seal region. A detailed description of the major packaging and payload components is presented in the following sections. Detailed drawings are presented in Appendix 1.3.1, *Packaging General Arrangement Drawings*.

1.1 Introduction

The GNF NPC is a transportation system designed to transport homogeneous or heterogeneous forms of Type A quantities of uranium bearing material that is enriched up to 5 weight percent (w/o). The packaging consists of a stainless steel sheet metal Outer Confinement Assembly (OCA) body and lid that encases ceramic fiber insulation and rigid polyurethane foam, and nine equally spaced, individually sealed stainless steel Inner Containment Canister Assemblies (ICCA's). The closure of each canister is provided by a closure lid with a silicone rubber gasket and a standard stainless steel bolted band clamp assembly.

The package is a Type A-fissile package. To provide criticality control, the outer cylindrical surface of each canister is wrapped with a minimum 20-mil cadmium sheet, a 15-mil High Density Polyethylene (HDPE) sheet wrapped to achieve a minimum hydrogen areal density of 0.199 gm/cm², and a stainless steel wrapper. Criticality control is also provided by the neutron moderating polyurethane insulating foam distribution within the OCA body and lid. The uranium bearing material is contained in the individual ICCA's. A stainless steel closure strip covers the OCA lid/body joint for additional protection.

Authorization is sought for shipment of 1,190 pounds (540 kg) of enriched uranium oxides or compounds per package (includes packaging) as a Type A(F)-96, fissile material package per the definitions delineated in 10 CFR §71.4¹. The criticality safety index (CSI) for the package, determined in accordance with the definitions of 10 CFR §71.4, is determined for each shipment. The CSI is based on the number of packages for criticality control purposes (method for the criticality safety index is defined in Chapter 6.0, *Criticality Safety Evaluation*).

¹ Title 10, Code of Federal Regulations, Part 71 (10 CFR 71), *Packaging and Transportation of Radioactive Material*, 1-1-98 Edition.

Uranium-bearing contents may be moderated by water or carbon to any degree and may be mixed with other non-fissile materials with the exception of deuterium, tritium and beryllium. Materials such as uranium metal and uranium metal alloys are not covered by this analysis.

For this package, undamaged packages have been analyzed in infinite arrays and hence pursuant to 10 CFR §71.59(a)(2) the more restrictive value of “N” is derived from the damaged array calculations. The Criticality Safety Index for criticality control is then derived from this value of “N” per 10 CFR §71.59(b).

This analysis demonstrates safety for $2N=150$ packages. The corresponding Criticality Safety Index (CSI) for criticality control of non-exclusive vehicles is given by $CSI = 50/N$. Since $2N = 150$, it follows that $N = 75$, and $CSI = 50/75 = 0.6667 \approx 0.7$ [rounded up to nearest tenth]. Using the rounded Criticality Safety Index result, the maximum allowable number of packages per non-exclusive use vehicle is $50/0.7 = 71$.

6.6.5 CRITICALITY SAFETY INDEX

The number of packages that remain below the upper safety limit determines the Criticality Safety Index (CSI) for criticality control. For normal conditions of transport, an infinite array size ($5N = \infty$) remains subcritical. Under hypothetical accident conditions, the contents of $2N=150$ packages would remain subcritical.

$$CSI = 50/75 = 0.6667 \approx 0.7.$$