

ENCLOSURE 4

M190194

Proposed NPC CoC Revision Mark-ups to be Included in
Revision 9 of the CoC

Non-Proprietary Information

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES**

1.	a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
	9294	89	71-9294	USA/9294/AF-96	1 OF	5

2. PREAMBLE

- a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."
- b. This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

3. THIS CERTIFICATE IS ISSUED ON THE BASIS OF A SAFETY ANALYSIS REPORT OF THE PACKAGE DESIGN OR APPLICATION

- a. ISSUED TO (*Name and Address*)

Global Nuclear Fuel - Americas, LLC
P.O. Box 780
Wilmington, NC 28402
- b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Global Nuclear Fuel - Americas, LLC, application dated
~~February 12, 2015~~ December 18, 2019.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

- (1) Model No.: NPC
- (2) Description

A cubic stainless steel and foam outer packaging with nine cylindrical containment vessels for the transport of type A quantities of low-enriched uranium oxide powder, pellets, and compounds of uranium as defined in 5(b). The overall package dimensions are approximately 45 inches wide, 45 inches deep, and 44 inches high.

The outer packaging consists of a 10-gage stainless steel outer shell with a ceramic fiber board liner and rigid polyurethane foam filler. The foam filler has a three-by-three array of vertical cylindrical cutouts that accommodate stainless steel sleeves for placement of the containment vessels. The outer packaging is equipped with a top cover that is secured to the outer packaging body by a combination of 16 closure cap screws and four closure strips secured by 24 bolts.

The containment vessel is a maximum 8.515 inches in inner diameter and approximately 32 inches in overall length. The containment vessel is constructed of 18-gage stainless steel, surrounded by a cadmium sheet and polyethylene wrap within a 24-gage stainless steel jacket. The containment vessel is closed by a 16-gage closure lid, a silicone rubber gasket, and a band clamp assembly, which is composed of a 0.063-inch thick strap and retainer, a T-bolt, and a nut.

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1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
9294	89	71-9294	USA/9294/AF-96	2 OF	5

The gross weight of the package (packaging and contents) is 1,302 kg (2,870 pounds). The maximum weight of the contents is 540 kg (1,190 pounds).

5.(a) (3) Drawings

The packaging is fabricated and assembled in accordance with the following Global Nuclear Fuel - Americas, LLC, Drawing Nos.:

177D4970, Sheet 1, Revision 1
177D4970, Sheet 2, Revision 0
177D4970, Sheet 3, Revision 0
177D4970, Sheet 4, Revision 0
177D4970, Sheet 5, Revision 0
177D4970, Sheet 6, Revision 0
177D4970, Sheet 7, Revision 0
177D4970, Sheet 8, Revision 1
SK105E4037, Sheet 2, Revision 1

(b) Contents

Type, Form, and Maximum Quantity of Material Per Package

Material Forms ⁺ (≤5.00 wt.% U-235)	Particle Size Restriction: Minimum OD (Inches)	Maximum Loading per ICCA (kgs)		Maximum Loading per NPC (kgs)	
		Net ⁴	Uranium	Net ⁴	Uranium
Homogenous Uranium Oxide/Compounds ²	N/A	60.0	52.89	540.0	476.4
Heterogenous UO ₂ Pellets (BWR)	0.342	60.0	40.54	540.0	364.8
Heterogenous UO ₂ Pellets (PWR)	0.300	60.0	40.54	540.0	364.8
Heterogenous Uranium Compounds ³	Unrestricted particle size	60.0	40.54	540.0	364.8

¹ No solutions or liquids are authorized and there shall be no free liquid present. The Material Form within any NPC must be the same.

² Homogenous compounds limited to UO₂, U₃O₈, UO_x, x>2, dried calcium containing sludges, UO₂(NO₃)₂·6H₂O, and uranium oxide bearing ash.

³ Heterogenous compounds limited to UO₂, U₃O₈, and UO_x, x>2.

⁴ Maximum content weight of any Inner Containment Canister Assemblies (ICCA) including plastic or secondary packaging (i.e., dunnage). Materials with a hydrogen atom density greater than

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1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
9294	89	71-9294	USA/9294/AF-96	3 OF	5

that of water are limited to a mass of 3.7 kg per ICCA. Table 1 – Type, Form, and Maximum Quantity of Material Per Package

<u>Material Forms⁴</u> <u>(<5.00 wt.% U-235)</u>	<u>Particle Size</u> <u>Restriction Minimum</u> <u>OD (inches)</u>	<u>Max. loading per</u> <u>ICCA (kg)</u>		<u>Max. loading per</u> <u>NPC (kg)</u>	
		<u>Net⁴</u>	<u>U</u>	<u>Net⁴</u>	<u>U</u>
<u>Homogeneous</u> <u>Uranium Oxide</u> <u>Compounds²</u>	<u>N/A</u>	<u>60.0</u>	<u>52.89</u>	<u>540.0</u>	<u>476.0</u>
<u>Heterogeneous UO₂</u> <u>Pellets (BWR)</u>	<u>0.342</u>	<u>60.0</u>	<u>40.5448.</u> <u>48</u>	<u>540.0</u>	<u>364.8436.</u> <u>3</u>
<u>Heterogeneous UO₂</u> <u>Pellets (PWR)</u>	<u>0.300</u>	<u>60.0</u>	<u>40.5446.</u> <u>71</u>	<u>540.0</u>	<u>364.8420.</u> <u>4</u>
<u>Heterogeneous</u> <u>Uranium Compounds³</u>	<u>Unrestricted Particle</u> <u>Size</u>	<u>60.0</u>	<u>40.54</u>	<u>540.0</u>	<u>364.8</u>

⁴No solutions or liquids are authorized and there shall be no free liquid present. The Material Form within any NPC must be the same.

²Homogeneous compounds limited to UO₂, U₃O₈, UO_x, x>2, dried calcium containing sludges, uranyl nitrate (UN), uranyl nitrate hexahydrate (UNH), uranium tetrafluoride (UF₄), sodium uranate, sodium diuranate, dried (sodium containing) sludges, ammonium diuranate (ADU), ammonium uranyl carbonate (AUC), uranium oxide bearing ash, and other solid uranium compounds with a percent uranium content less than theoretical UO₂.

³Heterogeneous compounds limited to UO₂, U₃O₈, UO_x, x>2.

⁴Maximum content weight of any ICCA including plastic receptacles (e.g., bags, bottles, etc.).

The material form column in Table 1 includes both homogeneous and heterogeneous uranium compounds in the form of dry solids resulting from scrap recovery processes and combustible waste incineration. Compounds include (but not restricted to):

- uranium oxides (UO₂, U₃O₈, or UO_x, x>2)
- uranyl nitrate (UN, UO₂(NO₃)₂)
- uranyl nitrate hexahydrate (UNH, UO₂(NO₃)₂*6H₂O)
- uranium tetrafluoride (UF₄)
- sodium uranate (Na₂UO₄)
- sodium diuranate (Na₂U₂O₇)
- sodium diuranate hexahydrate (Na₂U₂O₇*6H₂O)
- ammonium diuranate (ADU, 3UO₃*2NH₃*4H₂O)
- ammonium uranyl carbonate (AUC, (NH₄)₄*UO₂*(CO₃)₃)
- dried calcium (Ca) containing uranium compound/mixture/sludge/ash, such as CaUO₃, CaUO₄, Ca₂UO₅, Ca₂UO₄, Ca₃UO₆, CaU₃O₁₀*4H₂O, CaU₆O₁₉*11H₂O and CaU₆O₁₉*10H₂O
- dried sodium (Na) containing uranium compound/mixture/sludge/ash, such as Na₂U₂O₇*3H₂O and Na₂U₂O₇*H₂O
- dried iron (Fe) containing uranium compound/mixture/sludge/ash

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	9294	89	71-9294	USA/9294/AF-96	4 OF	5

The material form column in Table 1 must comply with the following constraints:

- Solutions and/or liquids are not authorized and there shall not be free liquid present. The solid form material within any individual NPC must be the same. Authorized uranium compounds may be mixed with other non-fissionable diluent materials (such as sand, iron, iron hydroxide, silica, carbon from ash, etc.) except for deuterium, tritium and beryllium. Materials such as uranium metal and uranium metal alloys are not authorized.
- Homogeneous/heterogeneous uranium materials are limited to solid form with a uranium weight fraction (UFACT) less than or equal to UO_2 ($\text{UFACT} \leq 0.88144$) at theoretical density ($\leq 10.96 \text{ g/cc}$).
- For purposes of the homogenous to heterogeneous transition; if the particle size distribution is such that a majority of the particles are $1730 \mu\text{m}$ or greater, then the unrestricted particle size payload of Table 1 applies. If a majority of the particle size distribution is below $1730 \mu\text{m}$, the homogenous payload of Table 1 remains valid.
- The maximum content mass of any ICCA inner packaging materials (e.g., HDPE/LDPE plastic bags or bottles) is unrestricted provided the mean hydrogen atom density of the material contents to be shipped inside the inner volume of each ICCA is not greater than water ($\leq 6.6734\text{e-}02 \text{ atoms/b-cm}$). This limit is applied as an average hydrogen density of the entire content mass (uranium compounds and packaging materials) over the fixed inside volume of each ICCA.
- Authorized materials also include UO_2 pellets present in standard BWR and PWR reactor fuel assembly lattice designs (e.g., PWR: 17X17; BWR: 10X10, 9X9, 8X8 nuclear fuel assemblies).
- The payload within an NPC may be distributed in any ratio within the nine ICCAs, provided that the content of any one ICCA never exceeds 132.2 pounds (60 kg), and the maximum uranium payload of Table 1 are met. Within an ICCA, the payload can be enclosed in plastic poly bottle receptacles (e.g., bags, poly bottles, etc.).

5.(c) Criticality Safety Index 0.7

6. In addition to the requirements of Subpart G of 10 CFR Part 71:

- The package must be prepared for shipment and operated in accordance with the Operating Procedures in Chapter 7 of the application, as supplemented. Within each ICCA, the contents and secondary packaging (i.e., dunnage) must provide a snug fit. The payload may be enclosed in plastic receptacles (e.g., bags, bottles, etc.). For payloads in plastic bottles, empty bottles may be used to minimize movement of the bottles within the ICCA.
- Each packaging must be acceptance tested and maintained in accordance with the Acceptance Tests and Maintenance Program in Chapter 8 of the application.

7. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.17.

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1.	a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
	9294	8 <u>9</u>	71-9294	USA/9294/AF-96	5 OF	\$

8. Transport by air of fissile material is not authorized.
9. Revision No. ~~6-8~~ of this certificate may be used until **November 30, 2015**.
10. Expiration date: **November 30, 2020**.

REFERENCES

Global Nuclear Fuel - Americas, LLC, application dated ~~February 12, 2015~~December 18, 2019.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

/RA/

Michele Sampson, Chief
Spent Fuel Licensing Branch
Division of Spent Fuel Management
Office of Nuclear Material Safety
and Safeguards

Date: **May 22, 2015**

