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

September 6, 2024

Brian R. Moore
General Manager, Core & Fuel Engineering
Global Nuclear Fuel – Americas, LLC
P.O. Box 780, M/C A55
Wilmington, NC 28401

SUBJECT: LETTER AUTHORIZATION TO USE THE MODEL NO. RAJ-II PACKAGE WITH AN INCREASED MAXIMUM AUTHORIZED FUEL PELLET SILICON CONCENTRATION

Dear Brian Moore:

As requested by your application dated July 15, 2024, pursuant to Title 10 of the *Code of Federal Regulations* Part 71, Certificate of Compliance (CoC) No. 9309, Revision No. 14, for the Model No. RAJ-II package is amended to authorize the use of the RAJ-II package for shipment of fuel pellets with a silicon concentration of up to 500 µg/gU with the conditions below:

(1) Authorization is for a maximum of four shipments of fuel pellets with a silicon concentration of up to 500 µg/gU.

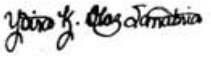
(2) All other conditions of CoC No. 9309 shall remain the same.

(3) If not accepted for loading at the reactor site, this authorization covers the return of the fresh fuel assemblies.

(4) This authorization shall expire on December 31, 2026.

If you have any questions regarding this authorization, please contact Pierre Saverot of my staff.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


Signed by Diaz-Sanabria, Yoira
on 09/06/24

Yoira Diaz-Sanabria, Chief
Storage and Transportation Licensing Branch
Division of Fuel Management
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-9309
EPID L-2024-LLL-0013

Enclosure: Safety Evaluation Report

cc w/encl: R. Boyle, U.S. Department of Transportation
J. Shenk, U.S. Department of Energy c/o L. F. Gelder

UNITED STATES
NUCLEAR REGULATORY COMMISSION
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Safety Evaluation Report
GLOBAL NUCLEAR FUEL – AMERICAS LLC
Docket No. 71-9309
Model No. RAJ-II Package

SUMMARY

By application dated July 15, 2024, (Agencywide Documents Access and Management System [ADAMS] Accession No. ML24197A080), Global Nuclear Fuel - Americas LLC (GNF) requested a letter authorization to use the Model No. RAJ-II package to ship demonstration bundles with an aluminosilicate (AlSi) additive in the UO_2 pellets and lead test assemblies (LTAs) containing lead test rods (LTRs) with that AlSi additive containing a silicon concentration up to 500 µg/gU.

GNF requested a deviation regarding the maximum authorized fuel pellet silicon concentration of 250 µg/gU, which is currently incorporated by reference in Condition No. 5.(b)(1) of Certificate of Compliance (CoC) No. 9309; however, it is also noted this concentration is not specified in the safety analysis report (SAR) for the package.

Based on the statements and representations in the application, the staff agrees that the change does not affect the ability of the package to meet the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 71.

GENERAL INFORMATION

The RAJ-II package is authorized for transport of up to two unirradiated BWR fuel assemblies or individual rods (BWR, generic PWR uranium oxide, or uranium carbide rods configured loose), that conform to the American Society for Testing and Materials (ASTM) C996 standard. This standard, which covers uranium hexafluoride (UF_6) that is intended for fuel fabrication, places upper limits on impurities, and includes a maximum silicon concentration of 250 µg/gU.

The applicant requested to increase the maximum silicon concentration to 500 µg/gU to support shipment, in the Model No. RAJ-II package, of lead test assemblies with an aluminum-silicon (AlSi) additive. Loading of such LTAs will allow in-reactor experience to be gained for an expanded qualification of this AlSi additive and will contribute to advanced fuel pellet designs. Such shipments are in support of GNF's accident tolerant fuel program.

EVALUATION

The applicant evaluated the shipment of the package with fuel pellets with a silicon concentration up to 500 µg/gU. This maximum allowed silicon concentration is not explicitly stated in either the CoC nor the SAR. The applicant states that this increased concentration is in accordance with the limits for impurity elements in ASTM C776. This ASTM C776 standard covers sintered uranium dioxide pellets, which is in fact the form of the material shipped in the Model No. RAJ-II package.

The applicant stated that the LTA fuel pellets will be made in accordance with the dimensions and densities listed in tables 3, 4 and 5 of the SAR and the increased concentration of silicon in the fuel pellets will not affect the structural performance of the package. The applicant also stated that silicon is not a radioactive material and is not limited by table 1-3 in the SAR.

Furthermore, since silicon is not a radioactive material, it does not affect the thermal performance, containment performance, or dose rates of the package. Also, since silicon is not a fissile material and the fuel pellet dimensions are unchanged by this letter authorization request, increasing the silicon concentration does not affect the criticality analysis of the package. Finally, the increased silicon concentration does not change how the package is operated, tested, or maintained.

The staff reviewed ASTM C776 and found it to be the appropriate standard for the contents being shipped in the RAJ-II package. The staff reviewed the SAR, the potential effects of an increased silicon concentration and determined that the evaluations contained within are unaffected by the increased silicon concentration proposed by the applicant.

The staff determines that the applicant's conclusions are acceptable.

CONDITIONS

The staff finds that the requested shipments in the Model No. RAJ-II package are in compliance with 10 CFR Part 71 provided the following conditions are met:

(1) Authorization is for a maximum of four shipments of fuel pellets with a silicon concentration of up to 500 µg/gU.

(2) All other conditions of CoC No. 9309 shall remain the same.

(3) If not accepted for loading at the reactor site, this authorization covers the return of the fresh fuel assemblies.

(4) This authorization shall expire on December 31, 2026.

CONCLUSION

Based on the statements and representations in the application dated July 15, 2024, the staff agrees that the use by Global Nuclear Fuel (GNF) of the Model No. RAJ-II package for the shipments of demonstration bundles with an aluminosilicate (AlSi) additive in the UO2 pellets with a maximum authorized fuel pellet silicon concentration of 500 µg/gU and lead test assemblies (LTAs) containing lead test rods (LTRs) with this AlSi additive meets the requirements of 10 CFR Part 71, subject to the conditions listed above.

Issued on September 6, 2024.