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

March 4, 2020

Mr. Richard W. Boyle
Radioactive Materials Branch
U.S. Department of Transportation
1200 New Jersey Avenue SE
Washington, D.C. 20590

SUBJECT: REQUEST FOR REVALIDATION OF JAPANESE CERTIFICATE OF APPROVAL J/2027/AF-96 FOR THE RAJ-IIIS PACKAGE – REQUEST FOR ADDITIONAL INFORMATION, DOCKET 71-3096

Dear Mr. Boyle:

By letter dated June 20, 2019 (Agencywide Documents Access and Management System Accession No. ML19220A165), the U.S. Department of Transportation requested that the U.S. Nuclear Regulatory Commission staff perform a review of the Japanese Certificate of Approval J/2027/AF-96, for the Model No. RAJ-IIIS transport package and make a recommendation concerning the revalidation of the package for import and export use.

In connection with our review, we need the information identified in the enclosure to this letter. This letter is to advise you that the information needed to continue our review is described as a request for additional information (RAI) in the enclosure to this letter. Addressing the RAI does not preclude the staff from issuing further requests for additional information during the detailed technical review of this application.

In order to complete our technical review on schedule, your response should be provided by March 23, 2020. If you have any questions regarding this matter, I may be contacted at (301) 415-5196.

Sincerely,

***/RA William Allen Acting for/***

Nishka Devaser, Project Manager
Storage and Transportation Licensing Branch
Division of Fuel Management
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-3096
EPID L-2019-LLA-0173

Enclosure:
Request for Additional Information

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE MODEL NO. RAJ-IIIS PACKAGE,

DATE: March 4, 2020

**DISTRIBUTION:**

D. Marcano ADimitriadis, RI BBonser, RII MKunowski, RIII
GWarnick, RIV

**ADAMS Memo Accession No.: ML20050N509** *** via email**

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| **DATE** | 02/19/20 | 03/03/20 | 02/19/20 | 02/19/20 | 03/04/20 |

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**Request for Additional Information**
**Docket No. 71-3096**
**Model No. RAJ-IIIS Package**
**Japanese Certificate J/2027/AF-96**

By letter dated June 20, 2019 (Agencywide Documents Access and Management System Accession No. ML19220A165), the U.S. Department of Transportation requested that the U.S. Nuclear Regulatory Commission (NRC) staff perform a review of the Japanese Certificate of Approval J/2027/AF-96, for the Model No. RAJ-IIIS transport package and make a recommendation concerning the revalidation of the package for import and export use.

This request for additional information identifies information needed by the NRC staff (the staff) in connection with its technical review of the Model No. RAJ-IIIS package application.

**Chapter 2 – Structural Evaluation**

2-1. Provide justification for the Section A.6.1.4, "Slanting Drop," statement, "[S]ince the energy absorption is eventually made in the same condition as the case of the horizontal drop, the impact force given to the fuel rods are less severe than the horizontal drop."

It's generally known that the secondary impact as related to "slanting drop" may result in a higher impact force than that associated with the package horizontal drop. The slenderness of the proposed package design for non-irradiated (fresh) fuel rods needs to be evaluated explicitly for the secondary impact effect, per the International Atomic Energy Agency (IAEA) Guidance SSA-26, "Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2012 Edition)." Specifically, Paragraph 702.2 of SSG-26 states, "[E]xperience suggests that the effect of secondary impact is often more severe for slender and rigid package, including:

(a) A package with an aspect ratio larger than 5, but sometimes even as low as 2;
(b) A large package when significant rebound is expected to occur following the 9 m drop;
(c) A package in which the contents are rigid and slender and particularly vulnerable to lateral impact."

This information is needed for the package revalidation for meeting the IAEA SSR-6 requirements as stated in the Certificate of Competent Authority.

**Chapter 4 – Containment Evaluation**

4-1. Provide the acceptance criteria for the X-ray or ultrasonic tests on the end plug/cladding welds.

Section (A)-D indicated that the end plug/cladding welds will be inspected using X-ray or ultrasonic testing to ensure integrity of the containment boundary. However, acceptance criteria for the inspections were not provided.

This information is needed to determine if the RAJ-IIIS package meets the requirements of paragraph 648 of IAEA TS-R-1.

Enclosure

4-2. Confirm that design and fabrication details of the fuel rods used in the demonstration test program are to be used in the production fuel rods transported in the RAJ-IIIS package.

Section (A)-D of the application stated that the fuel rods are the containment boundary. Although Section B of the application indicated there were no failures of the fuel rods after the demonstration's accident tests (e.g., drop, puncture, thermal), there was no information provided to confirm that fuel rods used in the demonstration test program were representative of the actual fuel rods to be transported.

This information is needed to determine if the RAJ-IIIS package meets the requirements of paragraph 648 of IAEA TS-R-1.

**Chapter 6 – Criticality Safety**

6-1 Revise the application to provide details of the cross-section adjustment performed to account for resonance self-shielding in the homogenized fuel / clad / moderator mixture. Additionally, provide a representative SCALE/CSAS5 input file for the Model No. RAJ-IIIS package criticality analysis.

Section E-4.3 of the application states: "as to the homogenization of inhomogeneous unit cell, a homogenized cross-section set that has equivalent reactivity is made using XSDRNPM built in the CSAS5 modules as well." However, the application does not provide the details of how this cross-section adjustment is performed. Staff needs this information to confirm that the cross-sections needed for the homogeneous approximation are adjusted properly. Additionally, the application does not include a representative criticality code input file, which the staff needs to confirm that the package is modeled as stated in Section E.3.

This information is needed for the staff to confirm that the package design will meet the criticality safety requirements of IAEA SSR-6, "Regulations for the Safe Transport of Radioactive Material."

6-2 Revise the application to include an estimate of criticality code bias and bias uncertainty in the calculated maximum $k_{eff}$.

The benchmarking analysis in Section E.5 of the application demonstrates that the code underpredicts $k_{eff}$ by an average of 0.007. The applicant included three times the Monte Carlo uncertainty ($3\sigma$) in each of the reported $k_{eff}$ results in the criticality analysis, meaning that all the results are non-conservative. Appendix VI, "Criticality Safety Assessments," of IAEA SSG-26, "Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2012 Edition)," states that biases and uncertainties should be established through comparison with critical experiments that are applicable to the package design. This guidance also states that an upper subcritical limit for the package should be determined based on the established bias and uncertainties and a margin of subcriticality. The applicant should develop an upper subcritical limit for the package criticality analysis, which includes code bias and bias uncertainty, using the guidance in IAEA SSG-26, Appendix VI.

This information is needed for the staff to confirm that the package design will meet the criticality safety requirements of IAEA SSR-6, “Regulations for the Safe Transport of Radioactive Material.”

**Chapter 7 – Materials Evaluation**

7-1. Provide a copy of the materials standard or other data to justify the mechanical properties of the zirconium alloy fuel cladding.

There is no detailed description of Static Experiment Critical Facility (STACY) fuel rods. SAR Table (B)-A.3 references Russian standard TC 001.411-2009 for the properties of the zirconium alloy. The staff requires a copy of this standard or other mechanical property data to verify the adequacy of the cladding structural analysis.

This information is needed for evaluating Japanese Certificate of Approval J/2017/AF-96, Rev. 0 for the Model No. RAJ-IIIS, to satisfy the requirements in IAEA SSR-6. The SSR-6 requirements include: 566 (b), 612, 614, and 616; Type A Package (635 – 651); Containing Fissile Material (673 – 686).