

**Request for Supplemental Information
for the Model No. NT-IV Package
Docket No. 71-3027**

By letter dated April 15, 2026 (Agencywide Documents Access and Management System [ADAMS] Accession No. ML26106A258), 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/37/AF-96, for the Model No. NT-IV transport package and make a recommendation concerning the revalidation of the package for import and export use.

This request for supplemental information identifies information needed by the NRC staff (the staff) in connection with its acceptance review of the Model No. NT-IV package application to confirm whether the applicant has submitted a complete application in compliance with regulatory requirements in the IAEA SSR-6, 2018 Edition.

Chapter 2: Structural Evaluation

OBS 2-1 Provide clarification on how stress concentration effects (higher stresses in the surrounding region of local geometric discontinuities of the component parts) have been accounted for in the fatigue evaluations for the reusable package components. Justify omission of or consider stress concentration effects, where it is applicable.

The application evaluates fatigue for the lifting cycle and pressurization cycle types for outer receptacle and fuel receptacle and their attachments in Sections (II)-A.4.4.3 and 5.1.5 of the safety analysis report (SAR). However, the staff could not locate any discussion on consideration of stress concentration factor to account for the effect of any irregularities or discontinuities of the component parts or justification thereof for not considering in the components' fatigue evaluations. In fatigue analysis, the stress concentration factor is used to account for the effect of discontinuities such as holes, grooves or notches, bolt threads, and head fillets that are typically not represented in analysis model or considered in stress calculation.

This information is needed to determine compliance with the requirements in paragraphs 613A of the IAEA SSR-6, 2018 Edition.

OBS 2-2 Provide fatigue evaluation due to vibration cycles during routine conditions of transport, and a complete evaluation of fatigue for the applicable reusable package structural components by considering the combined effects of all applicable types of accumulated stress cycles in components during normal service conditions.

The staff needs a complete fatigue evaluation that considers the combined effects of all applicable types of stress cycles during normal service, including consideration of the lifting cycles, pressurization cycles, thermal stress cycles and vibration cycles. If certain types of stress cycles are not applicable or negligible for certain components, explain why these are not applicable or are negligible.

Enclosure

SAR section II-A.4.7 provides an evaluation of the package components considering vibration caused by the vehicle during routine condition of transport over the road. However, the staff noted that the fatigue evaluation does not address the potential for fatigue of package components due to accumulation of the vibration cycles effects resulting from transports of the package during its service-life.

The following provide an example of the package components that may need to consider the combined effects from accumulated stress cycles as provided in the application:

Outer receptacle and fuel receptacle tie-bolts (bolts connecting top cover and the body of the receptacle): The staff recognize that lifting or pressurization cyclic stresses are already considered in the fatigue evaluation of tie-bolts in the SAR sections II-A.4.4.3 and II-A.5.1.5. However, the staff noted that the effects of vibration cycles are not considered for the tie-bolts. To perform an adequate analytical evaluation that demonstrates sufficient safety margin against fatigue failure of the tie-bolts, the combined effects of accumulated lifting or pressurization cycles along with vibration cycle types on the potential for fatigue in the bolts should be considered.

This information is requested to determine compliance with the requirements in paragraph 613A of the IAEA SSR-6, 2018 Edition.

Chapter 3: Thermal Evaluation

OBS 3-1 Revise the title of section 9, "Assumed Ambient Conditions," in the Competent Authority Identification Mark: J/37/AF, Package No. NT-IV certificate for approval. Also provide operating procedures for meeting the required ambient conditions.

In the Competent Authority Identification Mark: J/37/AF, Package No. NT-IV certificate for approval, Agencywide Documents Access and Management System (ADAMS) Accession No. ML26106A262, the title of section 9 is: "Assumed Ambient Conditions." Section 9 (page 2 of 7) further provides an ambient temperature range: -15 °C to 38 °C.

The minimum ambient temperature in section B.4.1.1(2) of the application is consistent with section 9 of the Competent Authority Identification Mark: J/37/AF, Package No. NT-IV certificate for approval. However, paragraph 639 of SSR-6 (for a Type A package) states that the design of the package shall take into account temperatures ranging from -40 °C to 70 °C for the components of the packaging. Similarly, paragraph 679 of SSR-6 (for a package containing fissile material) states that the package shall be designed for an ambient temperature range of -40°C to 38°C unless the competent authority specifies otherwise in the certificate of approval for the package design.

The certificate ambient temperature range of -15 °C to 38 °C is within the bounds of the broader temperature ranges listed in paragraphs 639 and 679 of SSR-6. Considering no supporting analysis (e.g., thermal, materials) has been provided to support meeting the ambient temperature ranges of -40 °C to -15 °C, staff suggests revising the title of section 9 to instead be entitled, "Required Ambient Conditions."

Operating procedures could include, for example: 1. periodic ambient environmental temperature measurements surrounding the package during the time the package is loaded with its contents and 2. forecasting (with margin) along the transit. These procedures should provide reasonable assurance that the ambient temperature conditions in the certificate of approval are met.

This information is needed to determine compliance with paragraphs 639 and 679 of SSR-6.

Chapter 5: Shielding Evaluation

OBS 5-1. Regarding the clarification of the radiation source term basis, SAR section II-D.2 provides activity values for unirradiated fuel (fresh fuel).

Confirmation is needed that the listed activity values reflect all contributing photon emissions from U-232 decay chains, U-234, U-238 series, and Tc-99.

This information is needed to determine compliance with paragraphs 527 of SSR-6, 2018 Edition.

OBS 5-2. Regarding the shielding model geometry reconciliation, SAR section II-D.3 describes atomic number densities and region definitions, but the fuel assembly and fuel-rod packaging unit have multiple designs (8×8, 9×9B).

Please provide:

1. Confirmation that the shielding model geometry corresponds to the bounding fuel design among the authorized contents and
2. A comparison table showing actual component dimensions vs. model dimensions, including cladding OD, ID, pitch, and any structural stainless-steel plates in the packaging unit.

This information is needed to determine compliance with paragraphs 527 of SSR-6, 2018 Edition.

OBS 5-3. Regarding the accident condition shielding basis, while fresh fuel emits negligible radiation, staff expect a demonstration that any configuration change under hypothetical accident conditions does not increase dose rates above regulatory limits.

Please provide:

1. A statement explaining why shielding performance is unaffected by:
 - 9-m drop deformation,
 - Lid displacement,
 - Honeycomb crushing, and
 - Fuel-rod packaging unit movement inside the receptacle.

2. Bounding geometric worst-case assumptions used in post-drop dose calculations (e.g., minimum separation distances).

If accident-condition dose rates were not calculated, justify why they are not required given the extremely low source term.

This information is needed to determine compliance with paragraphs 527 of SSR-6, 2018 Edition.

OBS 5-4. Regarding the demonstration of bounding fresh-fuel source term, because fresh fuel is low-risk, the staff require confirmation that the selected fuel design (9×9B vs 8×8) represents the bounding gamma source.

Please provide:

1. The activity differences between fuel types.
2. A statement identifying the bounding source term used for the shielding analysis.

This information is needed to determine compliance with paragraphs 527 of SSR-6, 2018 Edition.

Chapter 7: Materials Evaluation

RSI 7-1 Describe any national or international codes, standards, programs, and/or procedures that are implemented to ensure that package maintenance activities (including visual inspections, screening and evaluation of visual indications, and corrective actions such as component repairs and replacements) are adequate to manage the effects of aging in metallic package components that would see long-term use, such that the package components are capable of performing their requisite safety functions throughout the period of use.

SAR section III-B “Maintenance Requirements” identifies inspections but does not identify codes and standards, acceptance criteria, or personnel qualification requirements.

Per the guidance in International Atomic Energy Agency (IAEA) SSG-26, Paragraph 613A.3, “...the package should be evaluated during the design phase in the demonstration of compliance with the Transport Regulations”. Based on this evaluation, an inspection and maintenance program should be developed.

The program should be structured so that the assumptions (e.g. thickness of containment wall, leak-tightness, neutron absorber effectiveness) used in the demonstration of compliance of the package are confirmed to be valid throughout the lifetime of the packaging

The staff requests that this description address the following criteria:

1. Inspection methods (e.g., bare metal visual exams and/or other types of nondestructive exams such as liquid penetrant exams or ultrasonic exams)

for detection, characterization, and sizing of localized aging effects such as cracks or abrasion, pits, crevice corrosion and the effects of moisture and ultraviolet (UV) exposure on the package.

2. Inspection equipment and personnel qualification requirements (e.g., lighting and visual acuity requirements for performing visual exams) to ensure reliable inspections that can adequately detect and characterize indications of localized aging effects prior to component failure or loss of safety function.
3. Acceptance criteria for aging effects such as indications of fatigue and localized corrosion of stainless steel components, such as chloride induced stress corrosion cracking (SCC), pitting, and crevice corrosion. Examples of visual indications that may indicate potential localized corrosion of stainless steel components include the accumulation of atmospheric deposits such as salts, buildup of corrosion products, rust-colored stains or deposits, and surface discontinuities or flaws associated with pitting, crevice corrosion, and/or SCC.
4. Describe any surface cleaning requirements that are implemented to ensure that bare metal visual inspections of component surfaces are capable of detecting surface flaws, and for ensuring adequate removal of atmospheric deposits such as salts or other chemical compounds that may contribute to localized corrosion of stainless steel components.
5. Describe any flaw evaluation methods (such as flaw sizing and flaw analysis methods) and associated flaw acceptance criteria that may be used to determine whether components containing flaws are acceptable for continued service. In addition, describe what evaluations are performed for crack propagation.

This information is requested to verify compliance with requirements of the 2018 Edition of IAEA SSR-6, Paragraph 613A.

RSI 7-2

Clarify what storage controls or monitoring is in place to address aging mechanisms for the NT-IV transport package as a result of ultraviolet exposure, thermal variations, and humidity exposure when they are not in transport.

Per the guidance in IAEA SSG-26, Paragraph 613A.1, "Packaging components and package contents are subjected to degradation mechanisms and aging processes that depend on the component and the contents themselves and their operational conditions."

The staff found that while aging mechanisms are mentioned in SAR section II-F, Consideration of Aging for Nuclear Fuel Packages," there is no discussion of the following in the SAR:

- UV exposure effects on external coatings and materials
- Condensation and moisture ingress during long-term storage
- Temperature cycling effects on packings and impact absorbers

- Protective measures are taken

This information is requested to verify compliance with requirements of the 2018 Edition of IAEA SSR-6, Paragraph 613A.

RSI 7-3

Describe the maintenance criteria that are implemented to ensure the continued functionality of short-lived packaging components made of organic compounds, including the polyethylene foam and honeycomb paper buffer materials and the neoprene rubber packing materials.

The SAR does not address the maintenance requirements for ensuring the functionality of short-lived packaging components made of organic compounds, including the polyethylene foam and honeycomb paper buffer materials and the neoprene rubber packing materials.

The staff noted that adequate maintenance requirements are needed for such items to ensure that they will be capable of performing their requisite design functions throughout the operating life of the packaging. Adequate maintenance criteria for such items may include routine replacements on a specified short-term schedule (e.g., every transport operation), or routine inspections of these items before their use for each transport with suitable acceptance criteria to determine the need for replacement. Adequate maintenance criteria should ensure that these items do not show unacceptable damage or age-related degradation prior to their use for transport operations.

In addition, for organic material degradation, provide an evaluation of decomposition gases.

Per the guidance in IAEA SSG-26, Paragraph 613A.1, "The designer of a package should evaluate the potential degradation phenomena over time, such as generation of decomposition gases and the impact of these phenomena on performance of safety functions."

This information is requested in order to determine whether the package meets the requirements in Paragraphs 613A, 614, 639, 640 and 648 of IAEA SSR-6, 2018 Edition.

RSI 7-4

Provide replacement criteria or defined maximum service life for bolted hardware.

Per the guidance in IAEA SSG-26, Paragraph 613A.1, "The designer of a package should evaluate the potential degradation phenomena over time, such as corrosion, abrasion, fatigue, crack propagation, changes of material compositions or mechanical properties due to thermal loadings or radiation, generation of decomposition gases and the impact of these phenomena on performance of safety functions."

While the applicant performs a fatigue evaluation of the stainless steel bolts, there is no clear replacement criteria or maximum service life indicated.

This information is requested to verify compliance with requirements of the 2018 Edition of IAEA SSR-6, Paragraph 613A.

RSI 7-5 Provide coating described in SAR table II-F-1 for carbon steel components.

Per the guidance in IAEA SSG-26, paragraph 613A.1, “The designer of a package should evaluate the potential degradation phenomena over time, such as corrosion, abrasion, fatigue, crack propagation, changes of material compositions or mechanical properties due to thermal loadings or radiation, generation of decomposition gases and the impact of these phenomena on performance of safety functions.”

The applicant states that corrosion is unlikely to occur with carbon steel because the surface is coated, however no coating details are described in the SAR or drawings.

This information is requested to verify compliance with requirements of the 2018 Edition of IAEA SSR-6, Paragraphs 613A and 614.

Chapter 9: Operations Evaluation

RSI 9-1 Provide the un-redacted (un-masked) version of the NT-IV SAR, chapter III.

This information is needed to determine compliance with the requirements in Paragraphs 501-516 of the IAEA SSR-6, 2018 Edition.

RSI 9-2 Clarify the actions within NT-IV SAR, chapter III, that are required to determine the package physical and radiological condition prior to package unloading. Clarify if an abnormality is identified prior to package unloading what actions will be taken.

This information is needed to determine compliance with the requirements in Paragraphs 510 and 511 of the IAEA SSR-6, 2018 Edition.