

Enclosure: Request for Supplemental Information for Docket No. 71-3086; Model No. MG-1

This request for supplemental information (RSI) identifies information needed by the staff in connection with its acceptance review of the Revalidation request for Docket No. 71-3086; Model No. MG1 packaging, Argentine Certificate of Competent Authority RA/0099/B(U)F, Revision 4, transportation package.

Materials Review:

RSI M-1. Provide supplemental information for the MG1 Ageing Assessment (Document Number: 0908-GU01-3BEIN-056 Revision: B) and the MG1 Inspection and Maintenance Manual (Document Number: CDAD-1001-EM4GC-003 Revision: A) to address long-lived packaging components as follows:

1. Identify how the results of the MG1 Ageing Assessment are incorporated into the MG1 Inspection and Maintenance Manual so that the effects of ageing (aging) are specifically included in packaging inspections and addressed, as required, in packaging maintenance. Revise MG1 Inspection and Maintenance Manual, as needed to incorporate the results of the Ageing Assessment.

The staff note the following:

- (a) The MG1 Ageing Assessment, section 9, Annex 2 - Inspection Sheet Last Shipment, includes inspection sheets for the packages dated October 25, 2017. These inspections were conducted prior to the IAEA SSR-6 2018 edition and the regulatory requirements to consider ageing mechanisms and effects.
 - (b) Inspections for, and maintenance to address ageing effects are not included in MG1 Inspection and Maintenance Manual because the ageing effects identified in MG1 Ageing Assessment, subsection 2a Mechanical degradation and 2b Corrosion degradation are not incorporated into MG1 Inspection and Maintenance Manual, Figure 1, Inspection Sheet.
2. An assessment of credible ageing mechanisms and effects for the package based on the package design, component materials and safety functions, fabrication, and performance requirements.

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 staff note that MG1 Ageing Assessment, section 5, "Ageing Mechanism," lists ageing effects (e.g., cracks, loss of mechanical strength, reduction in wall thickness) rather than ageing mechanisms. The assessment of credible ageing mechanisms and effects should consider the range of operational environments, packaging materials of construction and packaging component functions that could be impacted by the effects of ageing mechanisms. The applicant is referred to the NRC's NUREG – 2214, "Managing Aging Processes In Storage (MAPS) Report," <https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr2214/> for additional information on aging mechanisms

and effects for material and environment combinations that may be relevant to transportation package components.

Enclosure

For the Type 304 stainless steel packaging components of a transportation package for unirradiated low-enriched uranium (LEU) fuel elements and control elements, the credible ageing mechanisms may include:

- localized corrosion, including pitting and crevice corrosion
- stress corrosion cracking
- fatigue
- wear
- abrasion
- galling

Credible ageing effects for these ageing mechanisms may include:

- loss of material (corrosion, wear, and abrasion)
- cracking (stress corrosion cracking, and fatigue)
- thread damage to fasteners and threaded components (corrosion, fatigue, wear, galling)

After reviewing the referenced documents, staff could not locate the following:

- (a) a description of the approach used to evaluate the ageing mechanisms and effects relevant to the package,
 - (b) identification of which ageing mechanisms and effects were determined to be applicable to the specific packaging components, and
 - (c) consideration of the ageing mechanisms or inspection and maintenance of the ageing effects for abrasion, fatigue, wear, galling, and stress corrosion cracking.
3. Inspection and testing methods (e.g., bare metal visual exams and/or other types of nondestructive exams such as liquid penetrant exams or ultrasonic exams). Identify any national or international codes and standards that are relied on for implementation of the packaging inspection and testing to address the effects of ageing standards and/or procedures for detection, characterization of ageing effects for the packaging. These may include codes and standards by the International Organization for Standardization (ISO), American Society of Mechanical Engineers (ASME), American National Standards Institute (ANSI), American Society for Nondestructive Testing (ASNT), ASTM International, or other codes and standards organizations.
- The staff note that MG1 Ageing Assessment, section 9 Annex 2 - Inspection Sheet Last Shipment, identifies the use of a dye penetrant inspection on the “4 lugs and their welds,” however, neither the MG1 Ageing Assessment nor the MG1 Inspection and Maintenance Manual identifies the inspection and testing standards or procedures that are utilized to identify ageing effects. In addition, neither document identifies the aging mechanism for the lifting lugs (i.e., fatigue).
4. Training and qualifications for personnel that perform package inspections. This may include a nationally or internationally recognized inspection qualification program, such as ASNT SNT-TC-1A, ANSI/ASNT CP-189, or ISO 9712:2021, or an internal (i.e., company specific) qualification requirement/procedure.
 5. Acceptance criteria for the inspection and testing methods specified to identify and assess the effects of ageing consistent with the guidance in IAEA SSG-26, Paragraph 613A.3 which states, “For packaging intended for repeated use, the effects of ageing mechanisms on the package should be evaluated during the design phase in

demonstration of compliance with the IAEA SSR-6. Based on this evaluation, an inspection and maintenance program should be developed.”

Describe the evaluation methods (such as sizing and analysis methods for identified ageing effects) and associated acceptance criteria that may be used to determine that components with identified aging effects are acceptable for continued service.

Although the applicant provided the MG1 Inspection and Maintenance Manual which describes inspection and maintenance procedure, the MG1 Inspection and Maintenance Manual does not specifically identify, or incorporate by reference, acceptance criteria that would be used to determine if the identified aging effects are (1) acceptable for continued service, or (2) unacceptable and require the packaging to be removed from service and repaired or replaced.

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

RSI M-2. Describe the maintenance criteria that are implemented to ensure the continued functionality of short-lived packaging components made of organic compounds, items such as the inner cover elastomer, nylon components and any other seals, gaskets and packing materials. 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.

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

General

GN 1 – Provide both the proprietary and non-proprietary versions of the safety analysis review. This document is required to confirm that no additional changes have been made to the safety analysis report (SAR) since the last review and to ensure that all modifications associated with this revalidation request have been accurately incorporated.

This information is required to verify compliance with requirements of the 2018 Edition of IAEA SSR-6, Paragraph 807.

Observation

Material Review

OBS M-1. Describe any surface cleaning requirements that are implemented to ensure that bare metal visual inspections of component surfaces are capable of detecting ageing effects, 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. This information may be needed to verify compliance with requirements of the 2018 Edition of IAEA SSR-6, Paragraph 613A.