

Request for Additional Information (non-proprietary)

By letter dated March 5, 2020, TN Americas LLC submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for renewal of the TN-32 Dry Storage Cask, Certificate of Compliance (CoC) No. 1021, pursuant to the requirements of Part 72 of Title 10 of the *Code of Federal Regulations* (10 CFR).

This request for additional information (RAI) identifies additional information needed by the NRC staff in connection with its review of this renewal application. Each RAI below describes information needed by the staff to complete its review of the subject application.

RAI-1. Provide additional information to justify the use of interim staff guidance (ISG)-2 Revision 2 (ML16117A080) to define the basis of the retrievability function of the TN-32 Cask, which differs from the approved design bases of the TN-32 casks.

Section 2.2 of the TN-32 renewal application states, "The retrievability safety function is based on the ability to remove a cask loaded with spent fuel assemblies from its storage location; i.e., option C in Revision 2 of Interim Staff Guidance (ISG) 2." However, TN-32 final safety analysis report (FSAR) Chapter 14, identifies 2 options for decommissioning, which appears to be inconsistent with the reference in Section 2.2 to ISG-2 Revision 2. Based on the information included in TN-32 FSAR Chapter 14, it appears that the design bases for the TN-32 system would be ISG-2 Revision 0 (ML092800367) dated October 6, 1998.

The staff notes that ISG-2 Revision 2 defines ready retrieval as "the ability to safely remove the spent fuel from storage for further processing or disposal," and provided three options for meeting the retrievability requirement. ISG-2 Revision 2 did not change the licensing bases for storage systems that were already approved.

This information is needed to determined compliance with 10 CFR 72.236(m) and 72.240(c).

RAI-2. Provide additional information to correctly reference the Overpressure Port Cover Seal in Table 3-6 of the renewal application.

This is identified as a component shown in FSAR drawing 1049-70-2 as item #16. It appears that this should be identified as Item number 18 as shown in in FSAR drawing 1049-70-2 and the TN-32 renewal application Table 3-5.

This information is needed to determined compliance with 10 CFR 72.240(c).

RAI-3. Provide additional information on how natural effects (e.g., vegetative roots, burrowing animals), are monitored and addressed so that the performance of a berm credited for radiation shielding and constructed from soil materials remains unaffected.

The staff notes that the application referenced the Electric Power Research Institute (EPRI) report, EPRI-1015078, Section 8.1, Description and Scope, which is focused on the use of earthen structures for water control structures and states, "Functions performed by earthen structures vary but are generally associated with control or storage of water. Accordingly, earthen structures perform a variety of safety-related functions for nuclear power plant sites including reservoirs for emergency power generation and plant ultimate heat sink and dikes for flood protection and wave abatement." The types of soil structures considered in EPRI-1015078 includes canals, dams, emergency cooling ponds, or levees and does not address the

use of soil structures for shielding. Therefore, it is not clear to the staff how the parameters monitored, inspected, or accepted using the criteria in EPRI-1015078 would address alteration of the berm caused by natural processes (e.g., vegetative roots, burrowing animals, etc.).

This information is needed to determined compliance with 10 CFR 72.240(c).

RAI-4. Provide additional information to account for the effects of the TN-32 leak rate on the end of life cavity pressure analysis provided in the TN-32 renewal application Section 3A.6.

The evaluation provided in the TN-32 renewal application Section 3A.6 accounts for the minimum average daily ambient design temperature for the TN-32 cask but does not include an assessment of the TN-32 leak rate. The staff notes that the TN-32 is not leak tight in accordance ANSI 14.5 and the technical specifications for the TN-32 system include a leak rate less than 10^{-5} cm³/second.

This information is needed to determined compliance with 10 CFR 72.240(c).

RAI-5. Provide the following additional information on Radiation Monitoring for the TN-32 Cask Aging Management Plan (AMP) and update the AMP as necessary. Because the shielding material is made of borated polyester and polypropylene, there is the possibility that heat from spent fuel coupled with age may degrade this material and reduce its shielding effect. The applicant proposes to use radiation monitoring at the perimeter fence to ensure that the shielding material maintains its' integrity.

Please provide:

1. Parameters Monitored or Inspected: A description of how the parameters monitored will be capable of identifying degradation or potential degradation before a loss of intended function for a specific cask considering that the number of TN-32 casks which may be loaded and placed on the independent spent fuel storage installation (ISFSI) storage pad can vary with time.
2. Detection of Aging Effects: The technical basis to show that detection of gamma and neutron radiation by the use of thermoluminescent dosimeters (TLDs) at the ISFSI perimeter fence has sufficient resolution to identify degradation of the shielding effectiveness for the individual casks. Section 4.3.4.2 of the renewal application states, "Detection of gamma and neutron radiation is accomplished by the placement of thermoluminescent dosimeters (TLDs) at the ISFSI perimeter fence, or between the ISFSI and locations used to show compliance with 10CFR20.1301 and 10CFR72.104. While the TLDs may not be capable of detecting all neutrons (i.e., the very high energy neutrons) they are effective in detecting adverse trends in neutron dose rates."
3. Detection of Aging Effects: Identify the personal qualifications for the staff that evaluate the radiation monitoring results.
4. Acceptance Criteria: The acceptance criteria (e.g., level of increase) that will be used to determine the annual upward increasing trend in neutron or gamma quarterly TLD readings at the ISFSI perimeter fence that indicates a loss of intended function of the shielding, including a description of how the criteria account for decay of the spent fuel source term and consideration for the use of the TN-32 system at an operating reactor or ISFSI where the number of storage casks is increasing with time.
5. Operating Experience: A summary of the available operating experience for similar cask designs such as those used at the North Anna ISFSI and the Prairie Island ISFSI. Include a description of how the TLD data trends at the Prairie Island ISFSI with the cask

survey results described in the Prairie Island ISFSI AMP (ML15285A007) will be considered in the Operating Experience AMP element.

This information is needed to determined compliance with 10 CFR 72.240(c).

RAI-6. Provide the following additional information on Visual Inspection for the TN-32 Cask AMP and update the AMP as necessary.

1. Parameters Monitored or Inspected: Identify the specific parameters that will be monitored or inspected and describe how those parameters will be capable of identifying loss of material due to general, pitting, crevice, and galvanic corrosion of aluminum.
2. Detection of Aging Effects: Identify the code or standard used to conduct the visual inspections. Describe the technical basis for the code or standard used for the visual inspection and explain how the application of the code or standard selected will have sufficient resolution to identify a defect dimension necessary to assess the extent of aging or quantify the loss of material. Justify the use of personnel that are not qualified to perform non-destructive examination (NDE) to conduct visual inspections for the TN-32 Cask AMP.
3. Monitoring and Trending: Describe what data will be collected and how the data collected will be evaluated. Includes a description of how the inspection results will be evaluated against the acceptance criteria.
4. Acceptance Criteria: Provide quantitative acceptance criteria for the evaluation of the loss of material due to general, pitting, crevice, and galvanic corrosion for the steel, stainless steel and aluminum components of the TN-32 cask. The description of the acceptance criteria should identify the extent of aging that prompts corrective actions to ensure that the structures, systems and components (SSC) intended functions and the approved design bases are maintained during the period of extended operation.
5. Operating Experience: Explain how the aging related effects identified in the operating experience review were incorporated into the TN-32 Cask AMP.

This information is needed to determined compliance with 10 CFR 72.240(c).

RAI-7. Provide the following additional information for the ISFSI Storage Pad AMP and update the AMP as necessary.

1. Parameters Monitored or Inspected: Clarify the statement in CoC renewal application Section 4.4.3 Storage Pad AMP which states, "The inaccessible areas of the storage pad that include below-grade surfaces off the storage pad."
2. Parameters Monitored or Inspected and Acceptance Criteria: Explain how ACI 349.3R is used to inspect concrete to assure that the thermal function will be maintained. Section 2.3.3 of the renewal application states, "However, a portion of the pad is included in the thermal models. Therefore, failure of the pad could affect the heat removal capability of the system, i.e., prevent fulfillment of an intended safety function." The staff notes that ACI 349.3R-2018 is focused on structural performance and states, "The purpose of this report is to provide the owner, owner's engineering staff, consultants, and others with an appropriate procedure and background for examining concrete structural performance and taking appropriate actions based on observed conditions." Therefore, it is not clear to the staff how the parameters monitored or inspected, and acceptance criteria based on ACI 349.3R-2018 will be applied to assure that the heat removal capability of the pad is maintained throughout the period of extended operation.

3. Detection of Aging Effects: Clarify the ACI 349.3R-2018 section referenced in the Storage Pad AMP Section 4.4.4. The section states “Direct visual inspections utilizing ACI-349.3R [4-3], Section 3.5.1 are to be conducted of the above-grade portions of the concrete storage pad, allowing for detection of aging effects from Table 4-2.” The staff notes that ACI 349.3R-2018 Section 3.5 is the Evaluation procedure document and there is no Section 3.5.1. It appears that the callout should refer to ACI 349.3R Section 3.6.1 which describes the visual inspection techniques and the inspection documentation.
4. Detection of Aging Effects: Describe the technical basis for using only the results of groundwater sampling to evaluate the degradation of the below-grade portion of the concrete pad. The staff notes that ACI 349.3R-2018 Section 3.4—Periodic evaluation states, “To verify that the selected sample areas are, in fact, representative of worst-case conditions, complementary sample area inspections should be made in areas where little or no degradation is expected. For example, structures primarily located below grade might not be readily accessible for evaluation, but could be exposed to an aggressive environment. Measures can be implemented that establish the condition of these structures through determination of soil and groundwater chemistry and local inspection during opportune soil excavations, such as during new equipment installation. While such efforts are indirect and not comprehensive, they can be used to characterize environmental exposure conditions and their effects to assist in prioritizing further evaluation efforts.”
5. Detection of Aging Effects: Clarify personnel qualifications for staff conducting inspections and indicate whether the guidance in ACI 349.3R Section 7 regarding personnel qualification will be required.

This information is needed to determined compliance with 10 CFR 72.240(c).

RAI-8. Provide the following additional information for the Earthen Berm AMP and update the AMP as necessary.

1. Parameters Monitored or Inspected: Describe the data collected and how the data collected will be used to assess the aging effects described in the Scope of Program including:
 - Loss of material due to wind erosion and surface flow
 - Loss of form due to surface flow, settlement, and frost action
 - Change in material properties due to desiccation
2. Detection of Aging Effects: Identify the data to be collected and describe or reference any specific methods to be used for data acquisition and documentation, including any applicable consensus codes and standards. Indicate how the data collected will be used to assess the aging effects described in the Scope of Program including:
 - Loss of material due to wind erosion and surface flow
 - Loss of form due to surface flow, settlement, and frost action
 - Change in material properties due to desiccation.
 - Justify the inspection interval of 5 ± 1 year is appropriate. Section XI.S7 of NUREG-1801, Rev. 2 and Reg Guide 1.127 Rev. 2 states that inspections for earthen structures should be done at a minimum of 5 years.
3. Monitoring and Trending: Describe the data to be collected and how the data collected will be used in monitoring and trending AMP element. Describe how the evaluation of the results against the AMP acceptance criteria will be conducted to ensure that the timing of

the next scheduled inspection will occur before a loss of intended function, corrective or mitigative actions.

4. Acceptance Criteria: Provide quantitative acceptance criteria for the evaluation of (1) erosion (2) scours or gullies from surface runoff, (3) settlement and (4) frost heaving. The description of the acceptance criteria should identify the extent of aging that prompts corrective actions to ensure that the SSC intended functions and the approved design bases are maintained during the period of extended operation.

5. Operating Experience: Provide a summary of available operating experience for berms or other earthen structures with the same or similar safety function. The staff notes that Prairie Island Nuclear Generating Plant ISFSI renewal application AMPS (ML15285A007) Section A2.5.2 states that the earthen berm is visually inspected at least once every five years for any evidence of change in material properties, loss of form, and loss of material.

This information is needed to determined compliance with 10 CFR 72.240(c).

RAI-9. Provide the following additional information in Table A-2.

1. Scope of program: Include the aging effects and mechanisms that will be managed via the TN-32 AMP into the Scope of program in Table A-2.
2. Parameters Monitored or Inspected: Identify the specific parameters that will be monitored or inspected and describe how those parameters will be capable of identifying loss of material due to general, pitting, crevice, and galvanic corrosion of aluminum.
3. Detection of Aging Effects: Identify the code or standard used to conduct the visual inspections. Justify the use of personnel that are not qualified to perform non-destructive examination (NDE) to conduct visual inspections for the TN-32 Cask AMP. Identify the personal qualifications for the staff that evaluate the radiation monitoring results
4. Monitoring and Trending: Describe what data will be collected and how the data collected will be evaluated. Include a description of how the inspection results will be evaluated against the acceptance criteria.
5. Acceptance Criteria: Provide quantitative acceptance criteria for the evaluation of the loss of material due to general, pitting, crevice, and galvanic corrosion for the steel, stainless steel and aluminum components of the TN-32 cask. The description of the acceptance criteria should identify the extent of aging that prompts corrective actions to ensure that the SSC intended functions and the approved design bases are maintained during the period of extended operation.
6. Include the reference to 4-2. Nuclear Energy Institute (NEI) 14-03, "Format, Content, and Implementation Guidance for Cask Storage Operations-Based Aging Management," Revision 2, Nuclear Energy Institute, December 2016.

The NEI 14-03 document contains guidance that is significant for the CoC users. The staff notes that only the information included in the CoC renewal application Attachment A will be incorporated into the Updated Final Safety Analysis Report (UFSAR) and information with respect to the aging mechanisms and effects managed by the AMPs is considered necessary to ensure that general licensees implement and update, as necessary, AMPs to maintain their effectiveness.

This information is needed to determined compliance with 10 CFR 72.240(c).

RAI-10. Provide the following additional information in Table A-3.

1. Scope of Program: Include a description of the aging effects/mechanisms will be managed via this AMP.
2. Detection of Aging Effects: Clarify personnel qualifications for staff conducting inspections and indicate whether the guidance in ACI 349.3R Section 7 regarding personnel qualification will be required.
3. Include the references to:
 - 4-2. NEI 14-03, "Format, Content, and Implementation Guidance for Cask Storage Operations-Based Aging Management," Revision 2, Nuclear Energy Institute, December 2016.
 - 4.3. American Concrete Institute, ACI-349.3R, "Evaluation of Existing Nuclear Safety Related Concrete Structures," 2018

The ACI Code contains information relative to the inspection of the storage pad. The NEI 14-03 document contains guidance that is significant for the CoC users. The staff notes that only the information included in the CoC renewal application Attachment A will be incorporated into the UFSAR and information with respect to the aging mechanisms and effects managed by the AMPs is considered necessary to ensure that general licensees implement and update, as necessary, AMPs to maintain their effectiveness.

This information is needed to determined compliance with 10 CFR 72.240(c).

RAI-11. Provide the following additional information in Table A-4.

1. Scope of Program: Include a description of the aging effects/mechanisms will be managed via this AMP.
2. Detection of Aging Effects: Clarify personnel qualifications for staff conducting inspections of the optional earthen berm.
3. Monitoring and Trending: Indicate what data will be collected and used in monitoring and trending AMP element.
4. Acceptance Criteria: Provide quantitative acceptance criteria for the evaluation of (1) erosion (2) scours or gullies from surface runoff, (3) settlement and (4) frost heaving. The description of the acceptance criteria should identify the extent of aging that prompts corrective actions to ensure that the SSC intended functions and the approved design bases are maintained during the period of extended operation.
5. Include the references to:
 - 4-2. NEI 14-03, "Format, Content, and Implementation Guidance for Cask Storage Operations-Based Aging Management," Revision 2, Nuclear Energy Institute, December 2016.
 - 4-4. EPRI 1015078, "Plant Support engineering: Aging Effects for Structures and Structural Components (Structural Tools)," December 2007.

The EPRI report and NEI 14-03 contain guidance that is significant for the CoC users. The staff notes that only the information included in the CoC renewal application Attachment A will be incorporated into the UFSAR and information with respect to the aging mechanisms and effects managed by the AMPs is considered necessary to ensure that general licensees implement and update, as necessary, AMPs to maintain their effectiveness.

This information is needed to determined compliance with 10 CFR 72.240(c).