Non-proprietary Request for Additional Information
NAC International
Docket No. 71-9235
Certificate of Compliance No. 9235
Model No. NAC-STC Transportation Package

By application dated March 15, 2016, NAC International (NAC) submitted an application for an amendment to Certificate of Compliance No. 9235, for the Model No. NAC-STC transportation package. This request for additional information identifies non-proprietary information needed by the U.S. Nuclear Regulatory Commission staff in connection with its review of the application. The requested information is listed by chapter number and title in the applicant's safety analysis report (SAR). The staff used the guidance provided in NUREG-1617, "Standard Review Plan for Transportation Packages for Spent Nuclear Fuel," in its review of the application.

As a result of your responses to our last request for additional information, each question describes information needed by the staff for it to complete its review of the application and to determine whether the applicant has demonstrated compliance with regulatory requirements.

Chapter 1 – General Information Evaluation

1-1 Revise Drawing No. 423-843 to include references to the impact limiter assemblies in Drawings 423-857 and 423-858, modifying the drawing as appropriate.

The applicant included two new drawings for impact limiters, Drawing Nos. 423-857 and 423-858, however, it does not appear that these impact limiters are used in any of the higher level drawings, (i.e., Drawing No. 423-843) as are the impact limiters shown on Drawing Nos. 423-257 and 423-258. If they are intended for (approval for) use, then the appropriate drawing should be modified to include them. Drawing 423-843 appears to be the appropriate drawing for these impact limiters.

This information is needed to confirm compliance with Title 10 of the *Code of Federal Regulations* (10 CFR) 71.33.

1-2 Revise Drawing No. 423-900 to ensure that all the cask assemblies in the bill of materials are shown as options in the body of the drawing, as is done in Drawing No. 423-843.

The applicant added cask assemblies 455-800-99 and 423-800-97 to the bill of materials in Drawing No. 423-900. However, it appears that the appropriate identifying numbers (11 and 12) should be added to the drawing in zone C4 next to the '1' that appears in that zone.

This information is needed to confirm compliance with 10 CFR 71.33.

Chapter 2 – Structural Evaluation

2-1 Clarify the following descriptions (shown below in bold font) to ensure that they are used or considered consistently in Section 2.13.6 of the application.

a. Page 2.13.6-1. "[T]he finite element model of the cask body used for the STC-HBU is based on the **NAC-CY** fuel contents model."

On page 2.13.6-2, the application states: "... bounded by the analysis of the NAC-STC cask body for the CY-MPC configuration." It's unclear whether NAC-CY is synonymous with CY-MPC for describing the previously approved package configuration.

b. Page 2.13.6-41. "Since the minimum Margin of Safety for the 30 foot drop cases is **0.31** from Table 2.13.6.13.1-12, the STC Cask design is acceptable for Accident Conditions of transport."

Table 2.13.6.13.1-12 lists a minimum margin of safety of 0.22, not 0.31, for the 30-foot, top corner drop, hot condition case.

c. See enclosure 1.

This information is needed to ensure compliance with 10 CFR 71.71 and 10 CFR 71.73.

2-2 Justify not evaluating the 1-foot and 30-foot free drop analyses for the cold ambient temperature of -40°F for the side-, top corner-, and bottom corner-drop orientations.

Both the hot and cold ambient temperatures of 100°F and -40°F, respectively, were analyzed for the cask top- and bottom-end drop orientations, but not for the side-, top corner-, and bottom corner-drop orientations. The application is unclear why the cold condition was analyzed only for limited cask drop orientations.

This information is needed to ensure compliance with the 10 CFR 71.71 (b) initial and 10 CFR 71.73 (b) test conditions on evaluating the cask structural performance for temperature cold condition.

2-3 See enclosure 1.

Materials Evaluation

All materials questions are proprietary.

Chapter 3 – Thermal Evaluation

3-1 See enclosure 1.

Chapter 4 – Containment Evaluation

4-1 Provide the cavity gas temperature in Table 3.8-6, "Maximum Temperature of the STC-HBU – Hypothetical Fire Accident Condition" for the NAC-STC with the high burnup contents during hypothetical accident conditions.

The application did not show how the hypothetical accident conditions pressure calculated in Section 3.5.4.1, "Maximum Internal Pressure Due to Directly Loaded Fuel" of the application was bounding for the high burnup fuel contents. A cavity gas temperature for the high burnup contents during hypothetical accident conditions was

not provided to show that a bounding temperature was used for the pressure calculation in Section 3.5.4.1 of the application.

This information is needed to determine compliance with 10 CFR 71.43(c).

4-2 Provide additional information regarding the seals and O-rings:

a. descriptions on Drawing No. 423-803, Sheet 1 of 2, Rev. 12 for all inner lid containment boundary seals, and provide descriptions on Drawing No. 423-806 Rev. 10 for all port cover plate containment boundary seals,
b. descriptions on the licensing drawings of seals or O-rings that are necessary to perform leakage rate testing, and
c. metallic seal product data sheets in Section 4.5 of the application.

Items 6, 7, 12, 15, and 22 on Drawing No. 423-803, Sheet 1 of 2, Rev. 12 are inner lid containment boundary seals, descriptions of these items (which are important to safety) have not been provided. Items 4, 5 and 6 on Drawing No. 423-806, Rev. 10, are port cover plate containment boundary seals, descriptions of these items (which are important to safety) have not been provided. Descriptions on the drawings of the seals or O-rings that are necessary to perform leakage rate testing on the containment boundary seals or O-rings have not been provided, but these components are also important to safety. These descriptions should specifically address seal dimensions and tolerances for the Viton O-rings (for example, see item 8 on Drawing No. 423-806, Rev. 10, Sheet 1 of 2) and metallic seals, and the specific material(s) and manufacturer for the metal seals. Product data sheets for the metallic containment boundary seals should be provided in Section 4.5 of the application, this should address the temperature limits for the metallic seals.

This information is needed to determine compliance with 10 CFR 71.33 and 71.51.

4-3 Revise the application to demonstrate how the closure bolt pre-load and torque values for the inner lid and port coverplate bolts provide adequate compression of the containment boundary dual Viton O-rings; Viton O-ring and metallic seal; and the dual metallic seals that are specified on the drawings.

The application has not demonstrated that the closure bolt pre-load and torque values in Table 7-1 of the application for the inner lid and port cover plate bolts provide adequate compression of the containment boundary dual Viton O-rings; Viton O-ring and metallic seal; and the dual metallic seals that are to be specified on the drawings (see question 4-3, above). Note that the leakage rate criterion is $< 9.3 \times 10^{-5}$ cm^3/s helium for the total of the three leakage tests for previously approved directly loaded intact/undamaged pressurized-water reactor (PWR) spent fuel assemblies having burnups of less than or equal to 45,000 MWd/MTU for immediate transport and is now leaktight for directly loaded intact/undamaged high burnup PWR fuel. Also note that metallic seals had been specified on the drawings and torque values in Table 7-1 of the application should be a function of the seal properties, but metallic seals are no longer specified on the licensing drawings.

This information is needed to determine compliance with 10 CFR 71.43(c) and 71.51.

Chapter 5 – Shielding Evaluation

5-1 Revise the SAR of the application to include a summary of the shielding analysis with fuel reconfiguration as a defense-in-depth for the proposed transport of high burnup fuel.

Though the licensing basis for this application is that the fuel will remain intact (undamaged), the applicant has also implemented a shielding analysis as part of a defense-in-depth approach that includes fuel reconfiguration. This analysis is done in a separate calculation package. The shielding analysis of SAR does not include this analysis, or any reference to the calculation package. The analyses such as these that are used to support an application in the SAR should be included in shielding section of the SAR and not as a separate calculation package.

This information is needed by the staff to determine the application compliance with 10 CFR 71.35.

Chapter 6 – Criticality Evaluation

6-1 Revise the SAR to include a summary of the criticality analysis performed for defense-in-depth for the proposed transport of high burnup fuel.

The applicant proposes that high burnup fuel, particularly fuel that meets the specifications for the Framatome-Cogema 17x17 PWR assembly type, be added to the package's acceptable contents. While the main basis for this proposal is that the fuel will remain intact (undamaged), the applicant has also included a criticality analysis as part of a defense-in-depth approach that includes fuel reconfiguration. However, this analysis is only described in a separate calculation package. The SAR for the application should also include a brief description of the analysis, including the analysis that was done, the results of that analysis, and a reference to the calculation package. The applicant should include analyses such as these that are used to support an application in the SAR.

This information is needed to confirm compliance with 10 CFR 71.35.

Questions 6-2 through 6-5 are proprietary.

Chapter 7 – Operating Procedures Evaluation

7-1 Describe in Section 7.1.3.1 of the application the preshipment leakage rate testing of the inner lid containment boundary metallic seal to the leaktight criterion for high burnup PWR fuel assemblies.

Section 7.1.3.1 (steps 15 – 18) of the application describes leakage rate testing of the inner lid containment boundary Viton O-ring for high burnup PWR fuel assemblies, but Section 7.1.3.1 of the application does not address the leakage rate testing of the alternative inner lid containment boundary metallic seal to the leaktight criterion for high burnup PWR fuel assemblies.

This information is needed to determine compliance with 10 CFR 71.51.

7-2 Clarify whether both steps 7.1.3.1.21 and 7.1.3.1.24 are necessary.

Step 7.1.3.1.21 appears to be repeated in step 7.1.3.1.24 of the application.

This information is needed to determine compliance with 10 CFR 71.51.

7-3 Provide the leakage rate test sensitivity in Table 7.4-1, containment condition B3.

Table 7.4-1 states the minimum test sensitivity is "< 1 x 10- cm-/sec (helium)", the numerical value and units are not accurate.

This information is needed to determine compliance with 10 CFR 71.51.

7-4 Provide, as part of defense-in-depth, a description on how the spent fuel contents of the package should be handled and unloaded if it is determined that damaged fuel is present.

Section 7.3.2.1, Step 4 describes the operations for determining whether or not the spent fuel contents include damaged fuel (i.e., fuel has been damaged during transport). However, the operations descriptions do not include information about how the package contents should be handled and unloaded in the situation that damaged fuel is determined to be present in the package. Appropriate operations descriptions should be included in Sections 7.3.2.1 and 7.3.3.1.

This information is needed to confirm compliance with 10 CFR 71.89.

7-5 Revise Chapter 7 of the application to make the following editorial changes:

- In Section 7.1.3.1.25 of the application, it appears the word "of" should be changed to "or,"
- In Section 7.4.3 of the application, remove, "If containment boundary."

This information is needed to ensure compliance with 10 CFR 71.87(f).

Chapter 8 – Acceptance and Maintenance Tests Evaluation

8-1 Modify the neutron absorber acceptance test information in Section 8.1.11 of the application to state that acceptance tests for TalBor must be done per Section 8.1.7 (i.e., that Section 8.1.11 does not apply to TalBor).

TalBor is a metal matrix composite-type of neutron absorber material and is only qualified for 75% credit for its boron-10 content. The acceptance tests in the proposed Section 8.1.11 include alternate tests for metal matrix composite-type absorbers, and this section indicates that these absorbers get 90% credit for their boron-10 content. Thus, Section 8.1.11 does not appear to consistently address TalBor and the amount of boron-10 credit given TalBor. Therefore, the application should be revised to clearly state that Section 8.1.11 does not apply to TalBor.

This information is needed to confirm compliance with 10 CFR 71.85.

8-2 Clarify Section 8.1.4.2 of the application to address that Viton O-rings cannot be used for extended storage.

Section 8.1.4.2 of the application states, “The Viton Orings shall be replaced at least annually during cask transport operations, or prior to transport if they have been installed longer than one year (i.e., after extended storage).” Section 8.1.4.2 of the application also states that, “Metallic O-rings must be used for direct loading of the NAC-STC with fuel for extended storage and for loading of a transportable storage canister (for transport).”

This information is needed to determine compliance with 10 CFR 71.51.