August 8, 2002

Mr. Thomas C. Thompson
NAC International
655 Engineering Drive
Norcross, GA 30092

SUBJECT: CERTIFICATE OF COMPLIANCE NO. 9235 FOR THE MODEL NO. NAC-STC PACKAGE - REQUEST FOR ADDITIONAL INFORMATION

Dear Mr. Thompson:

This refers to your application dated December 6, 2001, as supplemented July 18, 2002, requesting an amendment to Certificate of Compliance No. 9235 for the Model No. NAC-STC package.

In connection with our review, we need the information identified in the enclosure to this letter. Additional information requested by this letter should be submitted in the form of revised pages. To assist us in scheduling staff review of your response, we request that you provide this information by September 23, 2002. If you are unable to provide a response by that date, our review may be delayed.

If you have any questions regarding this matter, we would be pleased to meet with you and your staff. I may be contacted at (301) 415-8513.

Sincerely
/RA/
Nancy L. Osgood
Senior Project Manager
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-9235
TAC No. L23394

Enclosure: Request for Additional Information

August 8, 2002

Mr. Thomas C. Thompson
NAC International
655 Engineering Drive
Norcross, GA 30092

SUBJECT: CERTIFICATE OF COMPLIANCE NO. 9235 FOR THE MODEL NO. NAC-STC PACKAGE - REQUEST FOR ADDITIONAL INFORMATION

Dear Mr. Thompson:

This refers to your application dated December 6, 2001, as supplemented July 18, 2002, requesting an amendment to Certificate of Compliance No. 9235 for the Model No. NAC-STC package.

In connection with our review, we need the information identified in the enclosure to this letter. Additional information requested by this letter should be submitted in the form of revised pages. To assist us in scheduling staff review of your response, we request that you provide this information by September 23, 2002. If you are unable to provide a response by that date, our review may be delayed.

If you have any questions regarding this matter, we would be pleased to meet with you and your staff. I may be contacted at (301) 415-8513.

Sincerely,

/SA/
Nancy L. Osgood
Senior Project Manager
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-9235
TAC No. L23394

Enclosure: Request for Additional Information

Distribution: PUBLIC NRC File Center NMSS r/f SFPO r/f
Filename: C:\ORPCheckout\FileNET\ML022210012.wpd

ML 022210012

OFC	SFPO	E	SFPO		SFPO		SFPO		SFPO	
NAME	NLOsgood		MRDeBose		GEGundersen		HWLee		JASmith	
DATE	08/ 05/02		08/ 08/02		08 /05/02		08/07/02		08/ 07/02	
OFC	SFPO		SFPO		SFPO		SFPO			
NAME	ASGiantelli		AFDias		EPEaston		JDMonninger			
DATE	08/ 07/02		08/ 07/02		08 /07/02		08/08/02			

C=Without attachment/enclosure E=With attachment/enclosure N=No copy

OFFICIAL RECORD COPY

Request for Additional Information

Docket No. 71-9235
Model No. NAC-STC Package
Certificate of Compliance No. 9235

By application dated December 6, 2001, as supplemented July 18, 2002, NAC International requested an amendment to Certificate of Compliance No. 9235 for the Model No. NAC-STC package. This request identifies additional information needed by the U.S. Nuclear Regulatory Commission (NRC) staff in connection with its review of the application. The requested information is listed by chapter number and title in the application. NUREG-1617, "Standard Review Plan for Transportation Packages for Spent Nuclear Fuel" was used by the staff in its review of the application. This request 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.

1. GENERAL INFORMATION

Drawings

The packaging drawings and the description and justification to the changes made in the package design should be revised as described below. The provisions of 10 CFR 71.33, Package Description, require that the proposed package be described in sufficient detail to identify the package accurately and provide a sufficient basis for evaluation of the package.

1-1. Regarding Drawing No. 423-800, Rev. 9, address the following item:

The drawing indicated that Delta note 5 (zone A-8) has been changed by Rev. 9. No description of the change or the bases is provided in the application.

1-2. Regarding Drawing No. 423-802, Rev. 1, address the following items:

(a) Delete the phrase from Delta notes 2, 12, and 23, that: “NAC International shall approve alternate materials or procedures prior to fabrication.”

(b) Delta note 12 is not applicable to the radial welds in the Neutron Shield Tank (zone C-8).

(c) The description in BOM for items 6, 8, and 20, should be revised to include: “....or Forging.”

1-3. Regarding Drawing No. 423-803, Rev. 3, address the following items:

(a) The Revision numbers in Zone F-1 and Zone A-1 do not agree.

(b) Change Nos. 14 and 15 are not shown on the drawing.

1-4. Regarding Drawing No. 423-872, Rev. 5, address the following items:

(a) Change No. 1 is not shown on the drawing.

(b) Change No. 3 is not shown on the drawing and the change should be justified.

(c) A justification is not provided for Change No. 6.

1-5. Regarding Drawing No. 423-875, Rev. 3, address the following items:

It is not clear that the alternative details of weld joint, cladding, and Boral plate are applicable to the fuel tube of the NAC-STC Casks. Provide justification for this change.

1-6. Regarding Drawing Nos. 455-801, 870, 871, 872, 873, and 881, address the following items:

The application states that these drawings have been previously submitted and approved with the Part 72 Safety Analysis Report and have no effects on the suitability of the NAC-STC cask for transport. However, the applicant should check for consistency and confirm that the revision numbers are the same of those submitted to the NRC in the Part 72 Safety Analysis Report. For example, Drawing No. 455-871, Rev. 6, did not show change No. 4 as described in the application. Note that only packages that meet the conditions in Certificate of Compliance No. 9235 are authorized for transport under the general license provisions of 10 CFR 71.12. That is, packagings must be constructed in accordance with the drawings referenced in the certificate.

1-7. Regarding Drawing Nos. 455-887, and 888, address the following item:

Provide the evaluation that supports the revised weld sizes and configurations.

3. THERMAL

3-1. Revise Tables 3.4-1, 3.4-2, 3.4-3, and 3.4-4 to clarify if the seals are the main closure seals and to include the elastomeric containment system seals other than the main closure seal (e.g., vent and drain containment system seals). The application should show that these temperatures are within the service temperature limits for the Viton and EPDM seal materials.

The information is needed to show that the package meets the requirements of 10 CFR 71.51.

3-2. Revise the application to provide the calculation supporting the 0.339 Btu/hr-in-°F value for the neutron shield effective conductivity. It is not clear that the suggested electrical equivalent circuit (page 3.4-6 in the safety analysis report) correctly represents the neutron shield region that is shown. Identify each variable in the two equations that follow the figure showing the neutron shield sector models (parallel and series K_{eff}).

The provisions of 10 CFR 71.71 and 71.73 require that the package be evaluated under hot and cold temperature conditions, including fire.

3-3. Revise Section 3.4.1.1.3.2 of the application to provide K_{eff} values for the homogenized fuel region (assuming both helium and air as filler), as addressed on page 3.4-9. It is suggested that the information be provided in a simple table. Clarify whether any temperature dependence was considered.

The provisions of 10 CFR 71.71 and 71.73 require that the package be evaluated under hot and cold temperature conditions, including fire test conditions.

3-4. Provide the ANSYS input file that shows the complete ANSYS model for the 180°-section three-dimensional cask model under normal conditions of transport (100 °F, with insolation).

The provisions of 10 CFR 71.71 require that the package be evaluated under hot ambient temperature including solar insolation.

3-5. Section 3.3.2 specifies that Viton O-rings have a service temperature range of -40 °F to +400 °F. Provide a reference for these values. Note that the information provided on page 4.5-29 of the application shows that the service temperature range for Viton is -15 °F to +400 °F.

The provisions of 10 CFR 71.71 require that a package be evaluated under extreme temperatures of heat and cold.

3-6. Provide an overall description (e.g., material and dimensions, clearance from the cask) of the personnel barrier. Justify that the use of the personnel barrier does not affect the temperatures provided in Tables 3.4-1 through 3.4-5 of the application. Provide an estimate of the temperature at the surface of the personnel barrier, and show that the maximum temperature meets the requirements of 10 CFR 71.43(g). Clarify whether the personnel barrier is assumed to be present under hypothetical accident conditions.

3-7. Editorial: In Table 3.4-1, PTFE is misspelled.

4. CONTAINMENT

4-1. Revise the application to address the following items regarding the elastomeric (Viton and EPDM) containment system O-ring seals, to show that the package meets the requirements of 10 CFR 71.51:

a. Provide an evaluation of the effects of radiation on the O-ring materials, including consideration of service time and temperature. Note that elastomeric containment system seals should be replaced annually, or more frequently if needed.

b. Provide an evaluation of the effects of elevated temperatures on the EPDM O-rings. Note that the maximum temperature for EPDM material is listed as

300 °F on page 4.5-29 of the application, however, the maximum temperature for the seals under fire test conditions is listed as 314 °F in Table 3.5-1. Note that Table 3.5-1 indicates that EPDM has maximum service temperature limit for a duration of 10 hours or less of 375 °F. Provide the reference for this information. Also provide the maximum time that the EPDM O-rings would be exposed to temperatures above 300 °F based on the thermal analysis of the hypothetical accident fire condition, and show that this time duration is within the service limits for the material.

c. Remove Section 4.5.6 from the application. Note that Section 4.5.6 is not applicable to this design, since it apparently applies to Parker Compound Number V0835-75, which is not the same material as that specified in the packaging drawings in Appendix 1.3.2 of the application.

d. Show that the seals are appropriate for cold temperature service (i.e., -40 °F, with possible impact at -20 °F) with no decay heat.

4-2. Provide the calculation for the surface area for the reference PWR fuel assembly (3.54×10^5 cm^2) as shown on page 4.2-6 of the application.

It is not clear how this value was derived. The calculation is used to show that the package meets the requirements of 10 CFR 71.51.

4-3. Provide the SAS2H input files used for calculating the fission product inventory shown in Tables 4.2-6, 4.2-7, and 4.2-8 of the application.

The input file provides details regarding how the values in the tables were derived. This information is used to show that the package meets the requirements of 10 CFR 71.51.

4-4. For clarity and completeness, revise the application to address the following editorial comments:

a. Leakage rates in Chapters 4, 7, and 8 are specified in terms of cm^3/sec (helium). Clarify that these leakage rates are at standard conditions, or specify the helium temperature and pressure conditions.

b. The statement on page 4.1-1 of the application indicates that the leaktight criterion applies to all uses of the cask, whereas the cask is not tested to leaktight for all applications. The statement is as follows: "The NAC-STC containment boundary is designed to permit leak testing of the cask containment boundary penetrations prior to transport to confirm the leaktight integrity of the cask ..."

c. Clarify or justify the following discrepancy: The fuel rod height for the 17x17 assembly is shown as 152.3 inches in Table 5.2-2 and 151.6 inches on page 3.4-21.

d. Clarify the statement on page 4.2-3 of the application: "Based on a bulk average temperature of 450 °F when air is in the cavity...." Note that the 450 °F is used as a bounding value, and does not represent the temperature calculated when air is in the cavity.

e. Clarify that the 5.72 atm for internal pressure during accident conditions as indicated in Table 4.2-4 in the application is appropriate or conservative compared to the internal pressure calculated in the thermal analysis (page 3.5-6 of the application), which is 80.2 psia (5.46 atm), or revise the application to note the discrepancy.

f. Assure that Appendix 4.5 is complete and includes the current applicable manufacturer's data. The page numbering in the application is discontinuous indicating that several pages were omitted.

5. SHIELDING

5-1. Clarify and justify or correct the discrepancies between Tables 5.2-2 and 5.3-3 regarding the lower nozzle, upper nozzles, and upper plenum region heights. Both tables should be reviewed in detail to ensure they are consistent. Where inconsistencies exist, they should be noted and justified.

5-2. Remove references to high burnup fuel from Chapter 5.

The amendment did not include a request for burnups above 45,000 MWD/MTU. Chapter 5 shielding analyzes burnups up to 60,000 MWD/MTU. The staff review of this amendment request did not include the high burnup fuel.

5-3. Remove references to fuel enrichments above the maximum authorized in the Certificate of Compliance and the maximum evaluated for the Framatome-Cogema 17x17 fuel assemblies.

The amendment only requests the addition of the Framatome-Cogema 17x17 fuel assemblies with initial enrichments up to 4.5 weight percent U-235 to the NAC-STC package contents. The maximum enrichment for other fuel assembly types is 4.2 weight percent U-235.

5-4. Editorial: Provide a set of references with Chapter 5.

The list of references appears to be missing from Chapter 5.

5-5. Revise Chapter 5 to reference the design basis fuel information provided in Table 5.1-1 for the directly loaded fuel configuration. Otherwise, this information should be removed from Table 5.1-1.

The provisions of 10 CFR 71.31(a)(1), 10 CFR 71.31(b)(1), 10 CFR 71.35(a), and 10 CFR 71.41(a) require that the package contents be described in sufficient detail to provide an adequate basis for their evaluation.

5-6. Justify that the cross-section library used to evaluate the neutron and gamma source terms is appropriate. In particular, justify using SCALE4.3 to evaluate the neutron and gamma sources.

The revisions of SCALE4.3 to SCALE4.4a included updating of cross-section libraries. The application does not discuss which SCALE4.3 cross-section library was used to evaluate the source terms nor does it provide a sample input file. Justify that the cross-section library used to evaluate the source term was appropriate and that changes between SCALE4.3 and SCALE4.4a will not affect the gamma and neutron source terms. For example, the 27BURNUPLIB cross-section library from SCALE 4.3 could significantly underpredict the neutron source term. The provisions of 10 CFR 71.31(a)(1), 10 CFR 71.31(b)(1), 10 CFR 71.35(a), and 10 CFR 71.41(a) require that the package contents be described in sufficient detail to provide an adequate basis for their evaluation.

5-7. Revise the application to clarify the differences, if any, between the gamma source axial profiles provided in Figures 5.2-1 and 5.2-4.

The provisions of 10 CFR 71.31(a)(1), 10 CFR 71.31(b)(1), 10 CFR 71.35(a), and 10 CFR 71.41(a) require that the package contents be described in sufficient detail to provide an adequate basis for their evaluation.

5-8. Revise the application to better explain Note 1 of Table 5.2-2.

Table 5.2-2, Note 1, states that "increased hardware mass in 14x14 and 15x15 assemblies due to steel guide tubes/instrument tubes in reference models." Explain what this notation means and why this applies to the 14x14 and 15x15 reference assemblies and not to the 16x16 and 17x17 reference assemblies. The provisions of 10 CFR 71.31(a)(1), 10 CFR 71.31(b)(1), 10 CFR 71.35(a), and 10 CFR 71.41(a) require that the package contents be described in sufficient detail to provide an adequate basis for their evaluation.

5-9. Correct or justify the conflicting reactor input parameters, including assembly power, presented in Tables 5.2-3 and 5.2-4. In addition, clarify which values were used in the source term evaluation.

The staff reviewed the reactor input parameters provided in both Tables 5.2-3 and 5.2-4. The values provided in Table 5.2-4 will evaluate a lower burnup than intended. For example, taking a 15 x 15 reference assembly with the following parameters: %TD = 95%; pellet OD = 0.9319; active fuel length = 365.76 cm; and total number of fueled rods = 204, yields a total of 0.4671 MTU/assembly. Applying an assembly power of 15.55 MW/assembly over 1144.38 days of irradiation results in a total burnup of 38,097 MWD/MTU, not 40,000 MWD/MTU as indicated in the table. If the reactor input parameters in Table 5.2-4 were used, correct the source term evaluation as appropriate. Confirm that other values in the table are correct. The provisions of 10 CFR 71.31(a)(1), 10 CFR 71.31(b)(1), 10 CFR 71.35(a), and 10 CFR 71.41(a) require that the package contents be described in sufficient detail to provide an adequate basis for their evaluation.

5-10. Justify using a total of 0.4636 MTU/assembly for the 17x17 reference fuel assembly as indicated in Table 5.2-4.

The Framatome-Cogema 17x17 fuel assembly parameters provided in Tables 1.2-1 and 6.2-1 indicate a total of 0.469 MTU/assembly. Justify using the lower value from Table 5.2-4 to evaluate the source term. The provisions of 10 CFR 71.31(a)(1), 10 CFR 71.31(b)(1), 10 CFR 71.35(a), and 10 CFR 71.41(a) require that the package contents be described in sufficient detail to provide an adequate basis for their evaluation.

5-11. Justify using a 1.2 g/kg cobalt impurity for inconel and stainless steel for the Framatome-Cogema fuel.

The 1.2 g/kg cobalt impurity has been accepted by staff for fuel manufactured in the United States after 1989. The application does not provide adequate justification that fuel manufactured outside of the United States has the same cobalt impurity levels in inconel and stainless steel. Provide justification (e.g., published data) that this cobalt impurity value is appropriate or revise the source term analysis to use a conservative value. The provisions of 10 CFR 71.31(a)(1), 10 CFR 71.31(b)(1), 10 CFR 71.35(a), and 10 CFR 71.41(a) require that the package contents be described in sufficient detail to provide an adequate basis for their evaluation.

5-12. Revise the application to include the design basis gamma and neutron source spectra for the bounding source term(s). Gamma source spectra should be provided for the active fuel and each fuel hardware region.

The provisions of 10 CFR 71.31(a)(1), 10 CFR 71.31(b)(1), 10 CFR 71.35(a), and 10 CFR 71.41(a) require that the package contents be described in sufficient detail to provide an adequate basis for their evaluation.

5-13. Revise the application to include the calculation, algorithm, or a detailed description of the computer code used to rebin from the SAS2H standard neutron and gamma energy grouping to the MCBEND 28 neutron and 22 gamma standard group structures.

The provisions of 10 CFR 71.31(a)(1), 10 CFR 71.31(b)(1), 10 CFR 71.35(a), and 10 CFR 71.41(a) require that the package contents be described in sufficient detail to provide an adequate basis for their evaluation.

5-14. Revise the application to include the SCALE4.3 computer input files for the design basis gamma (including active fuel and each hardware region) and neutron source term calculations.

The provisions of 10 CFR 71.31(a)(1), 10 CFR 71.31(b)(1), 10 CFR 71.35(a), and 10 CFR 71.41(a) require that the package contents be described in sufficient detail to provide an adequate basis for their evaluation.

5-15. Clarify the statement in Section 5.3 that the NS-4-FR ranges from a minimum of 5.5 inches to a maximum of 5.925 inches. Justify that the NS-4-FR has been conservatively represented in the shielding model.

The provisions of 10 CFR 71.31(a) and 10 CFR 71.31(b) require that the package demonstrates that it meets the external radiation standards in 10 CFR 71.47 and 71.51.

5-16. Clarify the terms “Inside Tubes” and “Interstitial” in Table 5.3-1.

Table 5.3-1 lists “inside tubes” and “interstitial” as components of the fuel assembly. Clearly identify what portion of the fuel assembly is being described by these terms. The provisions of 10 CFR 71.31(a) and 10 CFR 71.31(b) require that the package demonstrates that it meets the external radiation standards in 10 CFR 71.47 and 71.51.

5-17. Editorial: Revise Tables 5.3-2 and 5.3-5 to include material densities in g/cc as well as in atom/b-cm.

5-18. Revise the application to include the calculation or a detailed description of the computer code used to convert ANSI N6.1.1-1977 flux-to-dose conversion factors into MCBEND energy groups.

The provisions of 10 CFR 71.31(a) and 10 CFR 71.31(b) require that the package demonstrates that it meets the external radiation standards of 10 CFR 71.47 and 71.51.

5-19. Revise the application to include sketches of the shielding model, both radially and axially, for normal and accident conditions.

The application should include detailed sketches, including all dimensions, of the shielding model for both normal and accident conditions. The location of the source (active fuel and end regions) within the shielding model should also be represented. The sketches should clearly demonstrate how streaming paths above and below the neutron shield were modeled. The sketches should also include the dose point receptor locations.

The application does not provide sufficient detail to determine if the NAC-STC as shown in the License Drawings provided in Chapter 1 has been appropriately represented in the shielding model. The provisions of 10 CFR 71.31(a) and 10 CFR 71.31(b) require that the package demonstrates that it meets the external radiation standards in 10 CFR 71.47 and 71.51.

5-20. Provide sample input files of the MCBEND 3-d shielding model. The sample files should include the most limiting cases.

The input files should be appropriate for the staff to verify the design basis neutron doses, gamma doses from the active fuel, capture gamma doses, and gamma doses from the activated hardware. The staff cannot determine if the NAC-STC design has been appropriately represented in the shielding models. The provisions of 10 CFR 71.31(a) and 10 CFR 71.31(b) require that the package demonstrates that it meets the external radiation standards in 10 CFR 71.47 and 71.51.

5-21. Justify that the 14x14 fuel assembly results in the bounding dose rates.

It has been staff's experience that the 15x15 or 17x17 fuel assembly designs typically result in the bounding dose rate conditions. These fuel design have a higher uranium loading (Table 5.2-2 indicates 13%) than the 14x14 fuel assembly which results in a larger source term for the same initial enrichment, burnup and cooling time. Provide additional information that shows that the 14x14 reference fuel assembly is bounding. The provisions of 10 CFR 71.31(a) and 10 CFR 71.31(b) require that the package demonstrates that it meets the external radiation standards in 10 CFR 71.47 and 71.51.

5-22. Provide additional information on the "3-dimensional dose response function method" used to generate fuel loading tables.

The application does not provide sufficient information regarding the "3-dimensional dose response function method" that was used to generate the fuel loading tables. As appropriate, the application should include sample calculations, algorithms, computer codes, and input files that demonstrate this method. Justify that using the fuel gamma response function is appropriate for evaluating the fuel hardware contributions to the dose rates and that the dose response function is appropriate for receptor locations adjacent to regions of reduced shielding (i.e., streaming paths).

The application should also demonstrate this "3-dimensional dose response function method" will accurately predict the dose rates for all fuel loading combinations. For example, the application should include a 3-dimensional MCBEND shielding calculation for at least two different fuel loading combinations and then compare the dose rate results with the results of the "3-dimensional dose response function" method.

The provisions of 10 CFR 71.31(a) and 10 CFR 71.31(b) require that the package demonstrates that it meets the external radiation standards in 10 CFR 71.47 and 71.51.

5-23. Justify the material composition of the neutron shield after the fire test.

Section 5.1.4.1 and Table 5.1-5, Note 1, state that the accident conditions dose rates assume a loss of gaseous neutron shield components (oxygen, hydrogen, and nitrogen). Justify why other materials present in the neutron shield (including carbon) are assumed to remain after the fire. Alternatively assume that the neutron shield material is completely removed after the accident test sequence. Show that the post-accident dose rate meets the requirements of 10 CFR 71.51 with the damaged neutron shield.

6. CRITICALITY

6-1. Page 6.1-2, Section 6.1.2, justify why different types of Boral sheets are used to surround the directly loaded fuel (i.e., 0.02 g $^{10}B/cm^2$) and canistered fuel (i.e., 0.01 g $^{10}B/cm^2$) and how NAC ensures that the proper Boral sheets are used for each application.

This information is necessary to demonstrate that the assumed conservatism used in the criticality evaluation adequately addresses the minimum loading of Boral in the sheets for both the directly loaded and canistered fuel, and that the package meets the criticality safety requirements of 10 CFR 71.55 and 71.59.

6-2. Page 6.4-2, Section 6.4.2.1, explain why the table indicates the reactivity difference between the Westinghouse 17x17 OFA fuel assemblies and the other assemblies when the bounding case is the Framatome-Cogema AFAM 17x17 assembly.

This information is necessary to ensure that the baseline modeled case adequately bounds all potential fuel loading configurations and enrichments and that the package meets the criticality safety requirements of 10 CFR 71.55 and 71.59.

6-3. Page 6.3-2, Section 6.3.3, explain the why two numbers are provided for H2O density (i.e., 1.00 and 0.9982 g/cc).

Since the KENO-Va computer code calculations rely on analyst provided input, it is necessary to ensure that the correct values are used for each application.

6-4. Page 6.4-2, Section 6.4.2.1, justify why the mechanical perturbation and moderator density studies that were performed for the Westinghouse 17x17 OFA assemblies at 4.2 wt% ^{235}U are applicable to the more reactive assemblies.

This information is necessary to ensure that the baseline modeled case adequately bounds all potential fuel loading configurations and enrichments and that the package meets the criticality safety requirements of 10 CFR 71.55 and 71.59. The application states that the reactivity trends versus basket parameters, component movement, and moderator density are applicable to the higher enriched fuel. However, no justification is given to show that these trends are applicable.

6-5. Page 6.4-6, Section 6.4.2.5, justify why the configuration documented in Section 6.4.2.2 is a bounding case to analyze the Framatome-Cogema 17x17 AFAM.

This information is necessary to ensure that the baseline modeled case adequately bounds all potential fuel loading configurations and enrichments and that the package meets the criticality safety requirements of 10 CFR 71.55 and 71.59. As indicated in the two tables compiling the calculated results of various mechanical perturbations, the difference in k_{eff} is relatively small, and the changes in fissile mass and moderator to fuel ratio between the AFAM and the OFA assemblies may yield different worst-case scenarios.

6-6. On page 6.4-11, the paragraph immediately following the table states that the worst case mechanical configuration of the fuel/basket and enlarged fuel tube evaluations was not modeled as adjusted from the assembly centered configuration. Justify this approach and show how the proposed addition of the Δk_{eff} of 0.004 to the k_{eff} conservatively bounds the worst case mechanical configuration.

This information is necessary to ensure that the constant effective neutron multiplication factor is a conservative assumption for the case in question that was not modeled explicitly and that the package meets the criticality safety requirements of 10 CFR 71.55 and 71.59.

6-7. Page 6.4-13, Section 6.4.3.5, justify that the assumed 0.004 Δk_{eff} adjustment is a conservative assumption as described in item number 6-6, above.

This information is necessary to ensure that the constant effective neutron multiplication factor is a conservative assumption for the case in question that was not modeled explicitly and that the package meets the criticality safety requirements of 10 CFR 71.55 and 71.59.

7. OPERATING PROCEDURES

7-1. Editorial: On page 7.1-8, step 19, delete the world "metallic" before the word "O-ring" in the first sentence, since either metallic or elastomeric O-rings can be used.

7-2. Revise Sections 7.2.1 and 7.2.2 to specify that radiation surveys are performed prior to installation of the personnel barrier in addition to after installation of the personnel barrier. This is to show that the package, as prepared for transport, meets the requirements of 71.47(b)(1).

7-3. Revise Section 7.1.3.1 (and any other sections for consistency) to clarify that the total integrated leakage rate from all seals must not exceed 4.1 x 10-5 cm^3/sec (helium) corrected to standard conditions of temperature and pressure, when using the cask with elastomeric containment system O-rings.

The application currently states that the leakage rate is an acceptance standard for each seal independently. This is needed to show that the package meets the requirements of 10 CFR 71.51.

8. ACCEPTANCE TESTS AND MAINTENANCE PROGRAM

8-1. Revise Section 8.1.3 (and any other sections for consistency) to clarify that the total integrated leakage rate from all seals must not exceed 4.1 x 10-5 cm^3/sec (helium) corrected to standard conditions of temperature and pressure, when using the cask with elastomeric containment system O-rings.

The application currently states that the leakage rate is an acceptance standard for each seal independently. This is needed to show that the package meets the requirements of 10 CFR 71.51.

8-2. Revise Section 8.2.4 and Table 3.2-1 to specify that elastomeric (Viton and EPDM) containment system O-rings shall be replaced with new O-rings within the 12-month period prior to shipment.