72-1015

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U.S. Nuclear Regulatory Commission
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Attn: Document Control Desk

Subject: Docket No. 72-1015

Submittal of Supplemental Information to RAI-1 Responses for the UMS® Universal Storage System Amendment for Maine Yankee Atomic Power Company Site Specific Spent Fuel (TAC No. L22979)

References:
1. Submittal of Responses to the Request for Additional Information (RAI-1) for the NAC-UMS® Universal Storage System Amendment for Maine Yankee Atomic Power Company Site Specific Spent Fuel, NAC International, February 4, 2000
2. Telecon Requests for Additional Information, U.S. Nuclear Regulatory Commission

In accordance with Reference 2, NAC International (NAC) herewith submits 10 copies of Supplemental Information to the Reference 1 responses for the NAC-UMS® Universal Storage System Amendment for Maine Yankee Atomic Power Company site specific spent fuel. This submittal includes the NRC comments and NAC's responses presented in the standard NAC RAI response format, along with the Revision UMSS-00B changed pages for the NAC-UMS® Maine Yankee SAR.

No changes to the NAC-UMS® Universal Storage System design or any of its components are introduced by this submittal and no drawing revisions are included. The List of Effective Pages and the Master Table of Contents for the SAR are updated to incorporate the text and page changes in the body of the SAR.

If you have any comments or questions, please contact me at (770) 447-1144.

Sincerely,

T C Thompson

Thomas C. Thompson
Director, Licensing and Competitive Assessment
Engineering & Design Services

Enclosure

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RESPONSE TO THE

UNITED STATES
NUCLEAR REGULATORY COMMISSION
TELECON RAIs

SUPPLEMENTAL INFORMATION TO RAI-1 RESPONSES

MAINE YANKEE AMENDMENT
NAC UNIVERSAL STORAGE SYSTEM (NAC-UMS®)

(TAC NO. L22979, DOCKET NO. 72-1015)

MARCH 2000

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

1 Damaged fuel definition – Since the process for NRC review and endorsement of the NEI (Industry) Protocol for the definition of intact/damaged fuel is continuing, NAC should revise the MY Amendment submittal to use the ISG-1 definitions or provide the analyses of the MY fuel to support the storage and transport of that fuel as proposed in the RAI-1 Responses.

<u>NAC Response</u>

The Table 1-1 ("Terminology") of Chapter 1 and Section A 1.1 ("Definitions") of Chapter 12 are revised to incorporate the ISG-1 definitions of intact and damaged fuel. The Safety Analysis Report text is revised as necessary to incorporate these definitions.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

2 NAC's RAI-1 responses related to the storage of the MY high burnup fuel assemblies demonstrate that the high burnup fuel characteristics are just like those of the fuel with burnups < or = 45,000 MWD/MTU. NAC needs to provide a comparison of the mechanical properties of the cladding for these two burnup categories to support the proposed storage of the high burnup fuel assemblies. The relationship of the cladding oxide layer thickness to the mechanical properties of the cladding should be considered, especially with respect to remaining ductility (i.e., elongation). Also, the cladding stresses, i.e., fuel rod buckling, should be evaluated for a bounding high burnup fuel rod considering the cladding properties and the reduced cladding thickness due to the oxide layer that is present.

NAC Response

Section 2.1.3.1.7 is added to the Safety Analysis Report to present a summary of the Maine Yankee high burnup fuel characteristics, mechanical properties of the cladding and their relationship to the cladding oxide layer thickness.

Section 11.2.15.1.5 is also added to assess fuel rod buckling in the end impact orientation. This evaluation assumes a cladding oxidation layer thickness of 80 microns and a 60g load. As shown by the analysis, the fuel rods do not buckle in the evaluated load condition.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

3 RAI-1, DP6-1 asked NAC to address potential preferential flooding of the MY fuel can due to the screen mesh size and the condition of damaged fuel following long-term storage. NAC responded that it would be addressed in the UMS Transport SAR RAI-1 Responses; what is the status of NAC's evaluation?

NAC Response

This analysis is essentially complete and shows that the occurrence of preferential flooding of the Maine Yankee fuel can is not the most reactive configuration. Therefore, the postulated condition does not represent a criticality concern.

This transport configuration analysis will be summarized in the NAC-UMS Transport Safety Analysis Report as revised in response to RAI-1.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

4 NAC should include in the SAR a comparison of characteristics on how the MY fuel fits into the criticality benchmark evaluation.

NAC Response

Section 6.6.1.4 is added to the Safety Analysis Report show a comparison of the most reactive system configuration parameters to the range of applicability of the critical benchmark parameters. The comparison shows that the evaluated parameters have values that are approximately in the mid-range of the benchmark parameters. Therefore, the critical benchmark evaluation provided in Section 6.5 is applicable to the Maine Yankee fuel evaluation.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

5 NAC should verify/clarify the continued use of the KENO computer code for criticality analyses for the MY amendment.

NAC Response

The criticality evaluation of the Maine Yankee fuel is performed using the KENO-Va code of the SCALE 4.3 CSAS sequence. No ANSWERS software (MONK) is used for the evaluation of the Maine Yankee fuel.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

6 Describe what is meant by "percent wear" on Page 38 of the Proprietary Report YAEC-1883P.

NAC Response

The percent wear refers to the measured reduction in the fuel rod cladding thickness at the interface between the fuel rod and the fuel assembly grid spacer. The report notes that the wear measurements did not produce any evidence of a rod-to-spacer grid fretting problem at Maine Yankee.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

7 Referring to SAR Page 4.5-8, provide an explanation of why use of the same thermal conductivity value for rubblized fuel as for an intact fuel assembly is appropriate.

NAC Response

The effective thermal conductivities for a design basis PWR fuel assembly are used for the debris region. This is conservative since the debris (100% failed fuel rods) is expected to have a higher density (resulting in better conduction) and more surface area (resulting in better radiation) than an intact fuel assembly. Further, the region above the debris is modeled using the thermal conductivity of helium, which provides additional conservatism in the model.

Section 4.5.1.1.8 is revised to incorporate this clarification.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

8 For 100% failed/rubblized fuel, explain why the calculated temperature assuming 100% compaction is lower than that assuming 50% compaction.

NAC Response

This condition occurs because the highest temperatures in the canister are near the center of the fuel assembly active fuel region. In the 100% compaction case for normal storage conditions, the fuel is assumed to be in the lower portion of the fuel can, away from the high temperature region. In the 50% compaction case, some fuel remains in the high temperature region, which results in a higher calculated temperature than for the 100% compaction case.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

9 NAC must ensure that the potential reconfiguration of the failed/rubblized fuel is evaluated for all disciplines.

NAC Response

The potential reconfiguration of failed fuel in the Maine Yankee fuel can has been evaluated for the structural, shielding and criticality disciplines. The shielding evaluation is provided in Section 5.6.1.4.5. The criticality evaluation is provided in Section 6.6.1.3. The structural evaluation is provided in Sections 3.6.1.2.and 11.2.15.1.2. The thermal evaluation is provided in Sections 4.5.1.1 and 4.5.1.2. Since the transportable storage canister is designed and tested as leak-tight, no additional confinement evaluation is required.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

10 Referring to SAR Section 4.5.1.1 for damaged fuel rods in guide tubes, add a justification for the effective radial thermal conductivity used with those rods in the guide tubes. Justify that the thermal evaluation bounds such an assembly, since it would seem that more fuel is present in the same volume as a standard assembly.

NAC Response

The fuel rods placed in the guide tubes have been removed from that same fuel assembly (i.e., the fuel rods are moved to a new position within the assembly). Therefore, there is no additional fuel in the same volume and the assembly remains bounded by the design basis heat load.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

11 Explain why the preferential loading procedure is no longer included in Chapter 8.

NAC Response

The preferential loading procedure was deleted from Chapter 8 because the fuel loading limitations are specified in Chapter 12 as Technical Specifications. The text originally provided was merely an anecdotal recitation of the general requirements. It did not provide sufficient detail, for example loading tables, to allow placement of fuel assemblies within the basket in accordance with design requirements, and could not be relied upon for that purpose. As described in NUREG-1536, the intent of Chapter 8 is to provide generic procedures and operating sequences. The loading operations for the canister are fully described in Section 8.1; however, as noted in the introduction to Section 8.1 and at Step 9, the fuel loaded into the canister must be selected in accordance with the criteria specified in Appendix 12B.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

12 Referring to SAR Section 4.2, explain how controls are implemented to ensure that fuel assemblies containing a CEA are stored in a Class 2 canister and that fuel assemblies not containing a CEA are not stored in a Class 2 canister.

NAC Response

The presence or absence of a Control Element Assembly (CEA) in a fuel assembly is determined by inspection because of the greater overall height of fuel assemblies with a CEA inserted. This difference is obvious even when the fuel assembly is still installed in the spent fuel pool rack. Consequently, visual control can be established over the presence or absence of a CEA in a given fuel assembly, and independent confirmation can be made. In addition, the position and characteristics of a fuel assembly are specified by pool rack location and fuel assembly serial number. Verification of fuel assembly serial number also serves as a check against inadvertent misloading of a fuel assembly.

Chapter 12, Technical Specifications, Table 12B2-6, Notes 3 and 4, require administrative control(s) that ensure proper loading of a Class 2 canister.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

13 How much damping was considered in the cask tipover analyses?

NAC Response

The cask tipover analysis considered 4% damping in accordance with ASCE 4-86.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

14 There appears to be an inconsistency in the specified compressive strength for the ISFSI concrete pad between Page 11.2.15-4 near the bottom (3000 psi) and Page 12B3-10, 6(c), (< or = 4000 psi). Please clarify/explain.

<u>NAC Response</u>

Section 11.2.15.1.1 is revised to refer to a range of concrete compressive strengths, from 3,000 to 4,000 psi so that it is consistent with Page 12B3-10. The range of concrete compressive strengths is based on additional tipover analysis that shows that a concrete compressive strength in this range results in a satisfactory tipover response.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

15 NAC's RAI-1 Response 11-5 stated that the SAR would be revised to include physical testing to demonstrate the validity of the static coefficient of friction between the VCC and the ISFSI pad surface that is used in the analysis in SAR Section 11.2.15. Please include this requirement in the SAR Chapter 12 Technical Specifications.

NAC Response

Section B 3.4.2 of Chapter 12 is revised to include physical testing to demonstrate the required coefficient of friction.

NAC INTERNATIONAL
SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

16 NAC should include in SAR Section 11.2.15, a summary of the sensitivity study of the effect on the calculated g-loads on a VCC of the tipover of that VCC on an ISFSI pad with a number of other loaded VCCs in position on the pad versus an empty pad.

NAC Response

Additional sensitivity evaluations considering varying values of the ISFSI concrete pad density have been performed. The results of those evaluations demonstrate that the maximum acceleration for the canister and basket are below 40g. Therefore, the maximum acceleration for the canister and basket for the cask tipover accident on the Maine Yankee site ISFSI pad is bounded by the 40g used in Section 11.2.12.4.1 (Analysis of canister and basket for PWR configurations for tip-over event).

Section 11.2.15.1.1 is revised to incorporate this conclusion.

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SUPPLEMEMTAL INFORMATION TO RAI-1 RESPONSES

17 Clarify the limitations on positioning of MY fuel cans in the UMS fuel basket/canister. Describe any restrictions for transport of such a canister, i.e., in the horizontal orientation.

NAC Response

Loaded Maine Yankee fuel cans are restricted to the four “corner” positions of the NAC-UMS® PWR fuel basket.

Based on the thermal evaluation for the 100% failed fuel condition described in Section 4.5.1.1.8, no restrictions for transport of the UMS Maine Yankee fuel canisters are required.