Non-Proprietary Request for Additional Information
Docket No. 72-1031
Certificate of Compliance No. 1031
Model No. MAGNASTOR Storage System

By application dated June 23, 2017(Agencywide Documents Access and Management System (ADAMS) Accession No. ML17179A382), as supplemented on July 5, 2017 (ADAMS Accession NO. ML17206A077), NAC International (NAC or the applicant) submitted an application in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 72 for an amendment to Certificate of Compliance No. 1031 for the Model No. MAGNASTOR® storage system. This request for additional information identifies 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 NRC staff used NUREG-1536, "Standard Review Plan for Spent Fuel Dry Storage Systems at a General License Facility — Final Report," in its review of the application.

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.

4.0 Thermal Evaluation

1. See Enclosure 2.

2. Confirm in the final safety analysis report (FSAR) that Section 4.8 and Section 4.9 remains relevant for the pressurized-water reactor damaged fuel basket 2 (PWR DF2).

   a) FSAR Section 4.8 provides benchmarks for previously submitted thermal analyses. Likewise, FSAR Section 4.9 discusses the thermal contingency events during PWR transportable storage canister (TSC) preparation and transfer operations. There were no statements in the FSAR Section 4.10, which describes the new PWR DF2 design, to clarify that the benchmarks (Section 4.8) and contingencies (Section 4.9) apply to the new PWR DF2 canister/cask design.

   b) In addition, justify how the results generated by the ANSYS and FLUENT versions used for the calculations produce reliable results if coding errors (e.g., duplicate surface input, radiative matrix code) are introduced, and explain how these are accounted for in the thermal results.

   This information is needed to determine compliance with Title 10 of the *Code of Federal Regulations* (10 CFR) 72.236(f).

3. Clarify in the SAR that both regular water flow through the alternate cooling water system (ACWS) and reverse water flow (R-ACWS) through the PWR DF2 canister/cask annulus will provide the performance values specified in the SAR and Calculation Package Nos. including 71160-3043 and 71160-3044.

   Reverse water flow conditions through the R-ACWS through the canister/cask annulus are discussed in SAR Section 4.10. Likewise, the Chapter 9, "Operating Procedures" in the SAR (page 9.1-5) mentions both ACWS and R-ACWS. However, regular water flow conditions (ACWS) are only analyzed in Calculation Package Nos. 71160-3043 and

71160-3044. Without further discussion, there is uncertainty in the cooling performance and subsequent component temperatures.

This information is needed to determine compliance with 10 CFR 72.236(f).

4. See Enclosure 2.

5. Clarify the initial conditions and boundary conditions for the vacuum drying process to determine that the cask provides adequate heat removal capacity.

   Item 5 of Calculation Package No. 71660-3044 (page 8 of 47) states that the initial temperature and temperature boundary conditions are set to those calculated in Calculation Package No. 71660-3043. Demonstrate how this was achieved considering:

   a. the calculations in Calculation Package No. 71660-3043 were two-dimensional FLUENT models whereas the vacuum drying was modeled with three-dimensional ANSYS models,

   b. the calculations in Calculation Package No. 71660-3043 are steady-state runs of a canister filled with helium or water (the canister is not empty).

   This information is needed to determine compliance with 10 CFR 72.236(f).

6. Provide the calculations and bases/assumptions for determining the pressure within the PWR DF2 canister during normal, off-normal, and the accident conditions.

   A discussion about the pressure within the new PWR DF2 canister needs to be provided to determine the performance of the cask during the operating conditions continues to be adequate.

   This information is needed to determine compliance with 10 CFR 72.236(f), and (g).

7. Clarify the flow resistance effect of the damaged fuel canister's four corner slots on flow and resulting thermal performance.

   Page 4.10-2 in the SAR stated that it was necessary to account for the flow resistance at the four corner slots containing the damaged fuel canisters. However, there was no discussion concerning how the flow resistance was modeled and the effect on thermal performance.

   This information is needed to determine compliance with 10 CFR 72.236(f).

8. Provide the calculation that demonstrates the minimum spacing between storage systems to achieve the stated thermal performance.

   Calculation Package No. 71160-3042 does not include the thermal interactions among neighboring storage systems. Therefore, the effects of the thermal interactions cannot be analyzed when reviewing the component temperatures.

   This information is needed to determine compliance with 10 CFR 72.236(f).

9. Provide the minimum/maximum temperatures and allowable temperatures for the new PWR DF2's important-to-safety components for normal, off-normal, loading/unloading, and accident conditions.

   The list of PWR DF2 components' maximum temperatures is not complete relative to the important-to-safety components listed in Table 2.4-1 of the SAR, which prevents a complete evaluation of the new PWR DF2 design.

   This information is needed to determine compliance with 10 CFR 72.236(f).

10. Provide the calculations that justify the water flow rate in step 19 of Section 9.3 in the SAR will not impact structural performance or operations.

    Calculations that support the wet unloading condition's water flow rate should ensure there are no excessive fuel assembly thermal stresses and over-pressurization.

    This information is needed to determine compliance with 10 CFR 72.236(f).

11. Provide the ANSYS and FLUENT models presented in the SAR and Calculation Package Nos. 71160-3042, 71160-3043, and 71160-3044.

    There were a number of cases discussed in the SAR and the calculation packages, but they were not provided and, therefore, a review of the boundary conditions/models could not be performed.

    This information is needed to determine compliance with 10 CFR 72.236(f).

12. Provide the effective thermal conductivity calculation and two-dimensional sub-model for the Type 2 neutron absorber discussed in the Section 4.10 of the SAR and Calculation Package No. 71160-3044.

    Section 4.10 and the Calculation Package No. 71160-3044 state that the Type 2 neutron absorber is to be used for the PWR DF2 system but there were no details about the effective thermal conductivity calculation to review.

    This information is needed to determine compliance with 10 CFR 72.236(f).

13. See Enclosure 2.

14. Clarify that the modifications (described in Calculation Package Nos. 71160-3042, 71160-3043, and 71160-3044) to previously submitted ANSYS and FLUENT system models for the MAGNASTOR® storage system (including its transfer cask) are limited to geometry changes to the system, rather than changes to modeling parameters and approaches.

    The review noted that the calculation packages listed numerous modifications to the storage, transfer, loading, and vacuum-drying ANSYS and FLUENT models. However, it is not clear whether some of the modifications are due to the distinct changes in the PWR DF2 geometry or modeling parameters and approaches.

    This information is needed to determine compliance with 10 CFR 72.236(f).

5.0 Shielding Evaluation

1. Provide revised calculations for the near field dose rate around the transfer cask and a new estimated dose for the occupational workers with the increased gamma dose rate due to reduced gamma shielding.

   In this amendment request, the applicant proposed to change the structural design of the transfer cask. The inner shell thickness of the modified transport cask is reduced by ¼ in. and the neutron shield thickness increased by ¼ in. order to accommodate the limit of the crane capacity. As a result, the gamma dose rate will increase due to the thinner inner shield. However, the applicant didn't provide a revised calculation for the dose rate near the transfer cask. This provides critical information for radiation protection of the occupational workers, especially the workers who perform cask loading and transfer operations. The applicant needs to provide revised calculations for the dose rate around the transfer cask and a new estimated dose for the occupational workers with the increased gamma dose rate due to reduced gamma shielding.

   The staff needs this information to evaluate the gamma dose to determine if the MAGNASTOR® cask with the amended design meets the regulatory requirements of 10 CFR 72.236(d).