

November 14, 2002

Kenneth J. Heider
Vice President, Operations and Decommissioning
Yankee Atomic Electric Company
19 Midstate Drive
Suite 200
Auburn, MA 01501

SUBJECT: EXEMPTION FROM 10 CFR 72.212 AND 72.214 FOR DRY SPENT FUEL
STORAGE ACTIVITIES

Dear Mr. Heider:

This is in response to your letter dated October 10, 2002, requesting an exemption from 10 CFR 72.212(a)(2), 72.212(b)(2)(i)(A), and 10 CFR 72.214, pursuant to 10 CFR 72.7. In your letter you requested an exemption from the requirements in Certificate of Compliance (CoC) No. 1025 for the NAC-MPC dry storage system. This exemption would allow Yankee Atomic Electric Company (YAEC) to store: (1) fuel with assembly weights up to 950 pounds; (2) fuel assemblies with unique design features; (3) non-intact fuel in damaged fuel cans; and (4) specific re-caged fuel assemblies in the NAC-MPC dry spent fuel storage systems at the Yankee Nuclear Power Station.

YAEC requested this exemption to store the additional fuel assembly configurations in an effort to continue the removal of spent fuel from the spent fuel pool into the NAC-MPC storage systems using the same experienced and trained individuals involved in loading the previous six NAC-MPC systems. The exemption would likely minimize personnel exposure by continuing to use the same individuals and by implementing lessons learned from the previous loading activities.

The U.S. Nuclear Regulatory Commission (NRC) staff performed a safety evaluation of the proposed exemption. The enclosed safety evaluation concludes that the requested changes will not compromise the structural performance of the NAC-MPC system nor increase the potential for dose to members of the public. Furthermore, the safety evaluation concludes that the requested changes do not reduce criticality safety for the NAC-MPC system.

In a letter dated May 15, 2002, the designer of the NAC-MPC system, NAC International, requested an amendment to Certificate of Compliance (CoC) No. 1025 for the NAC-MPC system to incorporate the additional fuel assembly configurations as approved contents for the storage system. That request was supplemented on October 3, 2002. The information provided in the amendment request, as supplemented, corresponds with the YAEC exemption request and provides the safety basis for storing these additional fuel assembly configurations. This information has been determined to be an adequate basis to grant the exemption. Accordingly, the exemption will be effective immediately.

The NRC staff evaluated the public health and safety and environmental impacts of the proposed exemption and determined that granting the exemption would not result in any significant impacts. For this action, an Environmental Assessment and Finding of No Significant Impact have been prepared and published in the Federal Register (67 FR 69051, dated November 14, 2002). A copy of the Federal Register Notice was provided to you by letter dated November 7, 2002. Based on the foregoing considerations, the staff has determined that granting the proposed exemption from the provisions of 10 CFR 72.212(a)(2), 72.212(b)(2)(i)(A), and 10 CFR 72.214 is authorized by law, will not endanger life or property or the common defense and security, and is otherwise in the public interest. Specifically, this exemption permits YAEC to store specific fuel assembly configurations as delineated in the attached Safety Evaluation Report. The storage of these fuel assembly configurations will not significantly impact the quality of the human environment. Therefore, the NRC staff has concluded that the proposed changes will not pose an increased risk to public health and safety.

If you have any questions, please contact me or Stephen O'Connor of my staff at 301-415-8500. Any future correspondence related to this action should reference Docket 72-31 and TAC No. L23516.

Sincerely,

/RA/ original signed by J. D. Monninger for /s/

Charles L. Miller, Deputy Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Docket Nos.: 72-31, 72-1025, and 50-029

Enclosure: Safety Evaluation

cc: Service List

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Docket Nos.: 72-31, 72-1025, and 50-029
Enclosure: Safety Evaluation
cc: Service List

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SAFETY EVALUATION REPORT

Docket No. 72-31
Yankee Atomic Electric Station
Independent Spent Fuel Storage Installation
NAC-MPC Exemption

SUMMARY

By letter dated October 10, 2002, Yankee Atomic Electric Company (YAEC) requested the U.S. Nuclear Regulatory Commission's (NRC's) approval for an exemption from certain 10 CFR 72.212 and 72.214 requirements. Specifically, YAEC requested an exemption from the requirements in Certificate of Compliance (CoC) No. 1025 to allow: (1) fuel with assembly weights up to 950 pounds; (2) fuel assemblies with unique design features; (3) non-intact fuel in damaged fuel cans; and (4) use of a re-caged fuel assembly for disposition of damaged fuel rods from a United Nuclear Type A fuel assembly. The licensee's justification for the exemption is that: (1) the requested changes are already under NRC staff review as part of the NAC International (NAC) NAC-MPC CoC amendment request, dated May 15, 2002; and (2) the exemption would likely minimize personnel exposure by continuing to use the same trained and experienced individuals used to load to first six NAC-MPC systems at the Yankee Nuclear Power Station (YNPS) and by implementing lessons learned from the previous loading activities.

The NRC staff has evaluated the exemption request as discussed below and concluded that the proposed changes would not pose an increased risk to public health and safety.

DISCUSSION

1. STRUCTURAL EVALUATION

1.1 Fuel Assembly Weights up to 950 Pounds

Appendix A of CoC No. 1025, Table 2A-1, shows the approved fuel assembly weights up to 900 lbs for structural design considerations. This weight was used for a fully loaded canister with 36 spent fuel assemblies or equivalents. However, the CoC limits the maximum content weight to 30,600 lbs, recognizing that not all fuel assemblies will weigh up to the approved maximum. The approval was based primarily on the Safety Analysis Report (SAR) Section 11.2.12.3 evaluation, which demonstrated satisfactory structural performance of the canister and fuel basket during a vertical concrete cask (VCC) tip-over accident. In the May 15, 2002, amendment request, the applicant continued to limit the maximum content weight to 30,600 lbs such that the previously calculated stress results for the canister shell remain to be applicable. However, to accommodate the actual weight of certain fuel assemblies which could potentially be in excess of the approved limit of 900 lbs, NAC performed a structural re-analysis of the fuel basket by assuming the maximum fuel assembly weight of 950 pounds. This resulted in a maximum fuel weight of 34,200 lbs for 36 assemblies. Although the CoC limits the overall content weight to 30,600 lbs, the applicant conservatively evaluated the fuel basket for a fuel weight of 34,200 lbs in Section

11.2.12.3.6 of the application, including the inertial load condition of four damaged fuel cans located in the basket corner positions.

The structural re-analysis of the basket support disk followed the same approach as for the approved contents in that weights of the fuel assembly, aluminum heat transfer disks, rods and spacers, and fuel tube are properly factored by appropriate g-load and conservatively applied as concentrated forces at the mid-span of the ligaments of the support disks. Tables 11.2.12.3-4 through -13 of the amendment application list stress results for the top five support disks. The minimum margins are 1.42 and 0.17 for the primary membrane and primary membrane-plus-bending stresses, respectively, which are positive and acceptable. Tables 11.2.12.3-14 through -18 of the amendment application list buckling evaluation results for the support disk ligaments. The interaction equations criteria for the ligament axial force and bending moment are satisfied, which ensures that the support disk will not buckle. On this basis, the NRC agreed that the canister and fuel basket would continue to have acceptable structural performance for fuel assembly weights up to 950 pounds.

1.2 Incorporation of Fuel Assemblies with Unique Features

There was no effect on the approved NAC-MPC structural performance as result of this requested change. This requested change is addressed in the Criticality Evaluation below.

1.3 Use of Damaged Fuel Cans

The exemption requests the use of a damaged fuel can to confine a Yankee Class intact fuel assembly, damaged fuel assembly, re-caged fuel assembly, or a reconfigured fuel assembly. As addressed in the May 15, 2002, NAC-MPC amendment request, NAC Drawing 455-902 presents design details of the 8.1 inch-square by 114.4 inch-long Yankee damaged fuel can. This damaged fuel can consists of an 18-gage stainless steel shell body, a bottom plate and a top closure assembly with screened openings to allow gaseous and liquid media to escape. As shown in NAC Drawing 455-871, four Yankee damaged fuel cans are required to be placed in the canister in conjunction with the use of a special shield lid machined with four 9.3 inch-square by 1.4 inch-deep recesses to provide needed space to accept the cans.

Section 3.4.1.1.11 of the amendment application presents a structural analysis of the Yankee damaged fuel can for normal operations, including can lifting. The welds and key components, including the tube body, closure lid, lifting lug, and side plates, are shown to have large stress margins. The corresponding analyses for a 60-g inertial load, which bound the impact g-loads associated with the VCC tip-over and 6-inch vertical drop accidents, are presented in Sections 11.2.12.3.7 and 11.3.2.5 of the application, respectively. These analyses also demonstrate acceptable stress performance and buckling capability of the Yankee damaged fuel can.

1.4 Use of Re-Caged Fuel Assembly

There was no effect on the approved NAC-MPC structural performance as a result of this requested change. This requested change is addressed in the Criticality Evaluation below.

2. CRITICALITY EVALUATION

2.1 Incorporation of Fuel Assemblies with Unique Features

The licensee requested an exemption to the NAC-MPC CoC fuel parameter requirements to address minor variations identified during inspection of spent fuel assemblies in the YNPS spent fuel pool. The changes potentially affecting criticality were addressed in the May 15, 2002, NAC-MPC CoC amendment application and included small changes above nominal values, such as a 0.03% increase in maximum enrichment for selected Yankee Rowe assemblies, which was shown to have a negligible effect on criticality safety. The staff agrees that storage of fuel assemblies with minor deviations from currently approved parameters, but which meet the enrichment limits and fuel rod configuration parameters of Table 12A2-2 of Amendment 1 to the SAR, dated April 2002, will continue to meet the criticality safety requirements of 10 CFR Part 72.

2.2 Use of Damaged Fuel Cans

The May 15, 2002, amendment application included an analysis of the use of a steel can to store damaged fuel assemblies. The exemption requested use of these damaged fuel cans prior to issuance of the CoC amendment to accommodate damaged Yankee Class fuel assemblies which cannot be reconstituted into a reconfigured fuel assembly. The damaged fuel can includes screened openings at the top and bottom to allow water flow while precluding the release of pellets and gross particles into the canister cavity. An analysis was presented in Section 6.4.3.7 of the amendment application and considered four damaged fuel cans in the corner positions of the MPC canister. The damaged fuel cans analyzed in the amendment application contained Yankee Class fuel assemblies missing up to 20 rods with 100% dispersal of these rods into the can. Section 6.4.3.8 of the amendment application presented an analysis considering preferential flooding and uneven drain-down of the damaged fuel can. These analyses result in a maximum k_{eff} of 0.926, for a NAC-MPC canister with 32 intact United Nuclear Type A assemblies and four damaged fuel cans, each containing United Nuclear Type A assemblies with 20 missing rods, in the corner guide tube positions. This k_{eff} is less than the calculated upper subcritical limit of 0.936 and below the 0.95 acceptance criteria.

2.3 Use of Re-Caged Fuel Assembly

The licensee also requested to include re-caged fuel assemblies as allowable contents in the NAC-MPC. Re-caged fuel assemblies consist of fuel rods removed from a United Nuclear fuel assembly and placed in an empty Combustion Engineering fuel cage. A criticality evaluation of the re-caged fuel assembly in any basket position, as presented in Section 6.4.3.1 of the amendment application, did not result in a statistically significant difference in reactivity from the United Nuclear Type A or Type B assembly.

3. SHIELDING EVALUATION

The NRC staff reviewed the exemption request and the May 15, 2002, NAC-MPC amendment request and determined that the changes requested in the exemption would not affect the radiation dose to workers or members of the public. The requested changes will

also not affect the ability of the NAC-MPC to continue to meet the requirements of 10 CFR 72.104, 72.106 and 10 CFR 20.1301.

The licensee indicated that it intends to use the proposed changes to preclude unnecessary dose to operators, fuel handlers and security personnel; and preclude the loss of the current fuel loading campaign continuity. Maintaining continuity in the loading campaign will preclude the loss of contract personnel who have been trained and developed lessons learned in the current loading campaign. Continued use of these personnel will likely result in a reduced worker dose as compared to retraining new personnel when an NAC-MPC amendment has potentially been approved in the future. This is in accordance with good radiation protection practices by keeping doses as low as reasonably achievable.

CONCLUSION

The staff reviewed the YAEC exemption request to allow: (1) fuel with assembly weights up to 950 pounds; (2) fuel assemblies with unique design features; (3) non-intact fuel in damaged fuel cans; and (4) use of a re-caged fuel assembly for disposition of damaged fuel rods from a United Nuclear Type A fuel assembly. The staff found that the requested changes will not compromise the structural performance of the NAC-MPC system nor increase the potential for dose to members of the public. Furthermore, the staff found that the changes requested in the exemption do not reduce criticality safety for the NAC-MPC system. Therefore, the NRC staff has concluded that the proposed changes will not pose an increased risk to public health and safety.