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TMI-2 Cleanup Project Directorate
Attn: Dr. W. D. Travers
Director
US Nuclear Regulatory Commission
c/o Three Mile Island Nuclear Station
Middletown, PA 17057

Dear Dr. Travers:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Safety Evaluation for Replacement of
Loaded Fuel Canister Head Gaskets

Attached for your review and approval is the Safety Evaluation for replacement of head gaskets on loaded fuel canister in the Fuel Handling Building "A" Fuel Pool. Replacement of gaskets is necessary due to excessive leakage being experienced utilizing the existing canister head gasket seals. The safety evaluation shows that the gaskets can be replaced in the fuel pool without undue risk to the health and safety of the public.

Per the requirements of 10 CFR 170, an application fee of $150.00 is enclosed.

Sincerely,

Frank Standerfer

F. R. Standerfer
Vice President/Director, TMI-2

FRS/RBS/eml

Attachment

Enclosed: GPU Nuclear Corp. Check No. 00022340

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Recd w/check

Safety Evaluation for the Replacement of Loaded Fuel Canister Head Gaskets

Introduction

Due to excessive leakage past the fuel canister head gasket seals, it has been proposed that the current metallic gaskets be replaced. For those canisters that have already been loaded with debris, this gasket replacement will be performed in the fuel handling building. To perform this activity, the loaded canister must first be positioned in the dewatering station where the canister head will be removed. The head will then be transported, via crane, to a specially designed work table, which is attached to the dewatering station platform shield wall. The work table is rotatable, thus permitting the canister head to be turned over, which allows access to the gaskets on the underside of the canister head. After rotating the head, the two metallic gaskets will be removed and new ethylene propylene diene monomer (EPDM) gaskets inserted. Prior to returning the canister head to the canister for reinstallation, the head will be visually inspected for damage. If any damage is found, the head will be repaired or replaced.

The activities associated with the loaded fuel canister head gasket replacement have been evaluated to ensure that they can be performed in a safe manner. A summary of this evaluation and its conclusions are provided below.

Criticality Control

Various measures are in place to ensure that a fuel canister (with head removed) maintains a neutron multiplication, k_{eff}, below the licensing criteria for both planned ($k_{eff} \leq 0.95$) and accident conditions ($k_{eff} \leq 0.99$). First, Reference 1 analyses demonstrate that the maximum k_{eff} for a single, loaded fuel canister moderated with unborated water is 0.857. The removal of the canister head would not be expected to appreciably affect this value. Additionally, the canister will remain in spent fuel pool "A" during the gasket replacement. As the Technical Specifications require the water in spent fuel pool "A" to be borated ($\geq$4350 ppm), the water within any open fuel canister will also be borated. Taking credit for the borated water within the canister would reduce k_{eff} to a value well below 0.857. Consequently, it is concluded that the planned activities associated with the head gasket replacement will not result in a canister k_{eff} exceeding the normal conditions licensing criterion of 0.95.

Three postulated accident conditions have also been evaluated. The first accident considered was the emptying of an open canister's contents into spent fuel pool "A". The 4350 ppm boron concentration in the pool will ensure a $k_{eff} \leq 0.99$ (Reference 2). The second

postulated accident was an inadvertent filling of an open fuel canister with unborated water. As demonstrated in the previous paragraph, the k_{eff} for an open fuel canister filled with unborated water will be considerably less than 0.99, (i.e., ~0.857). Finally, the last accident evaluated was the drained pool condition. In this case, any water remaining in the open canister will be borated to at least 4350 ppm, thus ensuring $k_{eff} \leq 0.99$. The presence of the boral shroud, inherent in the fuel canister design, will tend to reduce the dry-pool k_{eff} even further. Therefore, it is concluded that if the postulated accident conditions were to occur during the head gasket replacement activities, the resultant k_{eff} would not exceed the accident condition licensing criterion of 0.99.

Radiation Protection and Contamination Control

With the potential for fuel fines to collect in and about the canister head's catalyst bed, the possibility exists for radiation exposure to personnel. Engineered processes and controls will be used to a practical extent to minimize the need for respiratory protective equipment. Provisions to reduce direct radiation exposure dose rates to acceptable levels will also be implemented, as necessary. If water flushing of the canister head is required, a water source which contains at least 4350 ppm boron will be utilized. The degree of radiological hazard for the gasket replacement is commensurate with other contaminated work efforts by GPU Nuclear. Thus, contamination controls necessary for gasket replacement operations will not need to be more rigorous than previously implemented control measures. The Radiological Controls Department will monitor dose rates and airborne radioactivity levels during the gasket replacement operations. Based on the radiological conditions observed, shielding and other protective measures may be established by the Radiological Controls Department.

Removing the canister head presents the potential for the spread of contamination to the spent fuel pool water. Consequently, to minimize this potential, a temporary cover will be placed on the canister once the head is removed. Any contamination that is released to the pool will be from the canister's free volume water or from fuel debris within the canister. The relatively small quantities of soluble radioactive materials in the water will not have a significant impact when diluted with the large water volume of the spent fuel pool. Any fuel particles released to the pool will either settle out on the bottom of the pool or be entrained in the water. Water processing will be used as required to maintain acceptable radioactivity concentrations in the pool.

Any radioactivity releases off site resulting from the gasket replacement activities will be bounded by the evaluations performed in Reference 4.

Hydrogen Evolution

The presence of fuel in the canister could result in radiolytic decomposition of the water within the canister. The temporary cover placed on the open canister to minimize the potential for the spread of contamination to spent fuel pool "A" does not provide a seal, thus the canister will be open to the pool. With the canister being open to the pool, any hydrogen generated will be readily released to the fuel pool water and hence to the fuel handling building ventilation system. Consequently, no pressure build-up within the canister can occur and hydrogen evolution is not a safety concern.

Heavy Load Handling

To perform the gasket replacement, the canister must first be moved to the dewatering station. The handling of canisters in the fuel handling building has been previously evaluated in Reference 3. Once at the dewatering station, the canister head is removed and placed on a work table that is attached to the dewatering system platform shield wall. The combined weight of the canister head and work table (i.e., ~300 lbs.) will be considerably less than the maximum weight of a fully loaded canister (i.e., 3355 lbs.), thus the consequences of dropping the head and work table into spent fuel pool "A" are bounded by the evaluations provided in Reference 3. Additionally, appropriate measures will be taken to ensure that the canister head is completely disengaged prior to being removed from the pool, thus preventing an inadvertent lifting of an open canister.

10CFR50.59 Evaluation

10CFR50, Paragraph 50.59, permits the holder of an operating license to make changes to the facility or perform a test or experiment, provided the change, test, or experiment is determined not to be an unreviewed safety question and does not involve a modification of the plant technical specifications. This safety evaluation demonstrates that the probability of occurrence or the consequences of an accident or malfunction will not be increased during the gasket replacement activities. The safety evaluation also shows that the possibility of an accident of a different type than those evaluated in the TMI-2 FSAR will not be created. Finally, the margin of safety as stated in the bases for the TMI-2 Technical Specifications will not be reduced, as all activities to be performed are bounded by previously submitted Safety Evaluation Reports. Therefore, it is concluded that the head gasket replacement activities do not present an unreviewed safety question as defined in 10CFR50, Paragraph 50.59. Additionally, no technical specification changes are required to perform the gasket replacement activities.

Summary

Based on the above evaluation, it is concluded that the loaded fuel canister head gasket replacement activities can be performed in a safe manner.

References

1. Technical Evaluation Report for Defueling Canisters, 15737-2-G03-114, Rev. 2, January 31, 1986

2. Criticality Report for the Reactor Coolant System, 15737-2-N09-001, Rev. 0, October 29, 1984

3. Safety Evaluation Report for Heavy Load Handling Inside Containment, 15737-2-G07-105, Rev. 2, August 19, 1985

4. Safety Evaluation Report for Defueling the TMI-2 Reactor Vessel, 15737-2-G07-108, Rev. 9, March 6, 1986