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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
Extended Core Stratification Sample Acquisition Activity

The purpose of this letter is to provide additional information relative to the acquisition of a core sample from the lower head region. As stated in GPU Nuclear letter 4410-86-L-0091, dated June 23, 1986, damage to the incore nozzles as a result of this limited activity in the lower head region has been judged to be highly unlikely. The letter additionally stated that, in the unlikely event of nozzle damage, the capability exists to mitigate the consequences of the resultant leakage. The following additional information is provided for clarification.

A previous analysis (Reference 1) assumed leakage of approximately 17 gpm from a ruptured incore instrument pipe immediately below the Reactor Vessel (RV) wall. A second analysis (Reference 2) assumed damage to all (52) incore guide tubes as a result of a plenum drop. The resultant leakage was 20 gpm. Both analyses demonstrated the capability to mitigate the consequences of a leak of that magnitude (i.e., 17-20 gpm) and were approved by the NRC. To bound the proposed activity, a worst case, nonmechanistic scenario was postulated. It was assumed that a single incore pipe was driven through and completely out of the RV lower head leaving a 1.035 inch diameter hole in the lower head. The resulting leak rate is approximately 125 gpm. (NOTE: GPU Nuclear has identified no mechanism capable of accomplishing this displacement.)

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If a 125 gpm leak is assumed to occur, approximately 4 hours would elapse before the water level reached the bottom of the RV hot leg nozzles (elevation 314'). The assumed water level is the current 327'6" level. Leak detection capability in the Internals Indexing Fixture (IIF) is alarmed at ±3 inches from the current level. This alarm setpoint corresponds to a leak of approximately 500 gallons or approximately 4 minutes of leakage at the assumed leakrate. As a backup to the alarm, during this drilling operation and for 1 hour after removal of the drillstring, the IIF water level will be logged at 15 minute intervals. Leakage at 125 gpm for 15 minutes would result in leakage of approximately 1900 gallons which corresponds to a 11.5 inch decrease in water level.

Upon detection of a leak, the appropriate valve lineup would be made to begin gravity flow from the Borated Water Storage Tank (BWST) to the RV. Currently, all valves necessary to begin this flow are remotely operated from the Control Room. It is estimated that achieving the proper lineup would take approximately 10 to 15 minutes. In the event a valve had to be operated manually, approximately 30 minutes would be added to the time required to perform the valve lineup. Therefore, the combined maximum time from the beginning of leak to initiation of makeup flow from the BWST to the RV (i.e., assuming one manual valve operation) is estimated to be 60 minutes or 25% of the available time.

Currently, the BWST contains approximately 445,000 gallons of water at approximately 5050 ppm boron. Of this inventory, 355,000 gallons is assumed to be available for gravity feed to the RV.

The Reactor Building basement currently contains approximately 40,000 gallons of water. The last sample of the basement water indicated a boron concentration of approximately 2650 ppmB. For the purpose of this evaluation, the current administrative limits are assumed, i.e., a basement inventory of 70,000 gallons at 1700 ppmB.

Based on the above described plant conditions, approximately 47 hours of gravity feed from the BWST is possible. During that time, the Sump Recirculation System described in Reference 1 could be installed and made operable. It is estimated that the system would be installed and operable within 8-12 hours under ideal conditions. In any case, installation is expected to be completed in less than 24 hours. Therefore, sump recirculation could be accomplished for a minimum of approximately 24 hours to ensure proper mixing and verify boron concentration prior to establishing flow to the RV. (NOTE: The normally expected 3 volume recirculation cannot be accomplished. However, the mix of 70,000 gallons at 1700 ppm and 355,000 gallons at 5050 ppm results in a boron concentration of approximately 4500 ppmB which exceeds the Technical Specification minimum of 4350 ppm.)

Since the core sampling machine operates on normal plant A.C. power, any loss of off-site power will automatically stop drilling activities. No core sampling will be initiated under such conditions. The Technical Specification required diesels will remain available to provide power for water level monitoring and recirculation in the event of the loss of off-site power.

Based on the above, it is concluded that sufficient capability exists to maintain the TMI-2 core covered with borated water for an indefinite period in the event of the postulated nonmechanistic event involving the complete loss of an incore instrument nozzle during lower head core boring. Thus, the proposed activity can be conducted without undue risk to the health and safety of the public.

Sincerely,

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

FRS/RBS/eml

REFERENCES

1. Technical Specification Change Request No. 46, GPU Nuclear letter 4410-84-L-0154 dated November 6, 1984, F. R. Standerfer to B. J. Snyder

2. Safety Evaluation Report for Heavy Load Handling Over the TMI-2 Reactor Vessel, Revision 0, GPU Nuclear letter 4410-85-L-0089 dated April 19, 1985, F. R. Standerfer to B. J. Snyder