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Writer's Direct Dial Number

May 6, 1981
LL2-81-0061

TMI Program Office
Dr. Bernard J. Snyder
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Sir:

Three Mile Island Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Sump Water Contingency Plan

This letter is written in response to your letter dated January 6, 1981. Your letter contains comments and requests additional information concerning our submittal to you on November 4, 1980 (TLL 541). That submittal addresses the transfer and storage of the highly contaminated water, presently contained in the TMI-2 reactor building, in the event that removal of the water becomes necessary.

We agree with your statement in the January 6th letter that the use of TMI-1 tankage for storage of TMI-2 reactor building sump water is undesirable. However, we do not agree with your recommendation to upgrade the TMI "A" Spent Fuel Pool in preparation for sump water transfer and storage. The expenditure of our limited resources on this work, in our opinion, will be more benefically applied to engineering, construction, and preoperational testing of the Submerged Demineralizer System prior to placing it in service. We do not intend to identify the TMI-2 "A" Spent Fuel Pool to have a higher priority to TMI-1 shielding tankage in the event that transfer of the reactor building sump water becomes necessary.

Our responses to your comments are enclosed with this letter. Should you wish to discuss this matter further, we can arrange a mutually convenient time.

Sincerely,

G K Hovey

G. K. Hovey
Vice-President and
Director, TMI-2

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Attachment

cc: L. H. Barrett, Deputy Program Director

General Comments:

1. This contingency plan does not provide a current tank status for tanks other than the RCBT's. The plan should provide a summary of water currently in tanks that could safely be disposed of either to the environment or other on-site tanks. No information has been provided to assure that procedures exist to transfer water from the sump to tanks in Unit 1, Unit 2 or the Spent Fuel Pool. Procedures should be in place that would assure that safe transfers can be made to any tankage in either Unit 1 or Unit 2.

Response:

The contingency plan was intended to provide overall definition of the methodology to be used for water transfer and locations where water could be pumped from the sump. It was not intended to provide for the dynamic conditions of storage tank utilization. Storage tank status is recorded on a daily basis. The detailed implementation of the contingency plan would be based on tank status at the time should it be decided to implement the plan.

Procedures for transfer of RB sump water to the Unit 2 RCBT's and the Unit 2 "A" Spent Fuel Pool via the Decay Heat Pump from the Unit 2 RCBT's to the Unit 1 RCBT's and from the RCBT's to the EPICOR-2 monitoring tanks have been written. These procedures are being reviewed by the Plant Operations Review Committee (PORC). Procedures for transfer of RB sump water to the Fuel Pool Waste Storage System (Tank Farm) and the Unit 2 RCBT's using the waste transfer pump, WG-P-1, have been approved.

It must be recognized that we consider the consequences of storing raw sump water in the Unit 2 A Spent Fuel Pool to be severe. For this reason we identify this potential water storage location for completeness but would not intend to utilize it unless there were no other alternative.

General Comments:

2. Your plan does not describe which pumps and piping systems would be used to transfer sump water.

Response:

The procedures described in the response to General Comment #1 define the valve line ups as well as pump selection.

Specific Comments: Page 1 - #2

1. Is there an emergency plan in place for transferring sump water? Does the emergency plan provide assurance that transfer pathways and equipment would be available in a timely manner in the event a transfer is required?

Response:

The Emergency Plan for Transferring RB sump water to alternate storage locations (i.e., Unit 2 RCBT's, Fuel Pool Waste Storage System, the "A" Spent Fuel Pool, and the Unit 1 RCBT's) exists in the form of procedures described in the response to General Comment #1.

All transfer paths and equipment necessary to transfer reactor building sump water to the listed storage locations is available (installed). The ability of these components to function properly, if required, is verified through routine operational inspection. Prior to reactor building sump water transfer to each alternate storage location, valve line ups, priming and other operations would be performed as outlined in the individual procedures.

Specific Comments: Page 1 - #2

2. Are procedures written and approved for sump water transfer? Does an emergency procedure exist for denoting systems, priority of action, and specific procedural steps for a coordinated (consolidated) approach?

Response:

As indicated in the response to General Comment #1, all procedures are written. Two procedures are approved and three are being reviewed by the PORC. It is expected that all procedures will be approved in the near future.

Presently, an overall emergency procedure is being developed which delineates the use of the reactor building water transfer procedures. This priority outline will be used as a directive or cover procedure. Specific assignment of priority to each storage location is considered to be highly dependent upon type of emergency and plant status at the time of the required sump water transfer. In general, the priority sequence for the use of available storage capacity based on order of suitability is as follows:

1. Unit 2 - RCBT's
2. Unit 2 - Fuel Pool Waste Storage System (Tank Farm)
3. Unit 1 - RCBT's
4. Unit 2 - "A" Spent Fuel Pool

Specific Comments: Page 1 - #2

3. Anticipated time constraints are not listed for all phases of transfer evolutions, i.e., time to empty receiving tank with time to fill from sump. Please provide such information.

Response:

Tank	Total Volume (Gallons)	Time to Empty		Time to Fill	
		Rate (GPH)	Time (Hr)	Rate (GPH)	Time (Hr)
U-2 RCBTs via WG-P-1	231,750	9,650	24	2,700	85.8
U-2 RCBT via DH-P-1A/1B	231,750	9,650	24	15,000	15.5
Tank Farm	110,000	N/A*	N/A*	4,500	24.4
U-1 RCBTs	247,000	343	240/Tank**	2,400	102.9
U-2 "A" Spent Fuel Pool	320,000	N/A*	N/A*	12,000	26.7

* The Tank Farm and the Unit 2 "A" Spent Fuel Pool are presently empty. The Tank Farm will be utilized as feed tanks for the SDS system when it becomes operational.

** During operation of Unit 1, 10 days of processing time is required to empty each tank. It is not anticipated that all 3 tanks would ever be completely full. See Specific Comment #6b.

Specific Comments: Page 1 - #2

4. Identify safety related plant operations that would be affected in the event that sump water had to be transferred to tanks in Unit 2.

Response:

There are no "safety related plant operations" affected. However, there is concern for the safety of those personnel required to work in the affected areas. The Contingency Plan described includes transfer of the RB sump water to storage locations utilizing existing components, piping and tankage. The transfer paths selected are those that will provide the least radiation exposure to personnel and the storage locations are those that are already designed with appropriate radiological precautions or have sufficient shielding to accommodate the RB sump water. Neither the transfer paths nor the storage locations utilize equipment or impair operations of equipment needed for "safety related plant operations" under the current plant operational status. The safety of plant operations such as work being performed on the 347' EL of the Fuel Handling Building during or after utilization of Spent Fuel Pool "A" will be impacted. Other areas that may be impacted during the transfer are:

a. The south end of the U-2 Auxiliary Building, EL 280'6".

b. The south east corner of the U-2 Auxiliary Building, EL 305'0".

c. The east and north corridor of the U-2 Auxiliary Building, EL 328'0".

d. The east central portion of the U-2 Fuel Handling Building on elevations 328'0" and 347'6".

With effective flushing, these areas will be unrestricted after the transfer is completed. Several additional compartments and equipment that will be used for the emergency transfer are already restricted. Thus, the status of those areas would not change.

Specific Comments: Page 1 - #2

5. In Item #1 of your conclusions, you stated that storage locations exist within the plant to accommodate the entire quantity of sump water. We understand the word plant to mean tankage in Unit 2. If the entire inventory of sump water were transferred to Unit 2 tanks, what would be the remaining capacity available for flush water and inleakage?

Response:

Assuming that the Fuel Pool Waste Storage System (Tank Farm), the Unit 2 "A" Spent Fuel Pool, and the Unit 2 RCBT's are defined as "Unit 2 tankage" and that credit can be taken for their entire capacities, approximately 60,000 gallons of free volume would remain after completely draining the Reactor Building. Smaller tanks located in Unit 2 (i.e., Miscellaneous Waste Hold Tank, Contaminated Drain Tanks, Auxiliary Building Sump Tank, etc.) were not considered for storage of Reactor Building sump water or flush water directly resulting from the transfer of Reactor Building sump water. It is our opinion that storage of ≅200 uCi/ml water (containment sump water) within multiple small tanks will result in extensive system contamination as well as greater access restrictions in the Auxiliary Building than would be experienced by storing sump water only within the RCBT's, "A" Spent Fuel Pool, and the Tank Farm.

Specific Comments: Page 1 - #2

6. a. Are procedures written and approved for the emergency transfer of sump water to the Unit 1 RCBT?

b. What formal constraints will be imposed on Unit 1 if water is transferred, i.e., procedure requirements?

Response:

a. The two procedures required for the transfer of the Reactor Building sump water to the Unit 1 RCBT are written. The first procedure, which is approved, describes how to transfer water to the Unit 2 RCBT's utilizing WG-P-1 or DH-P-1A/1B. The second procedure, presently under review for approval, describes how to transfer water in the Unit 2 RCBT's to the Unit 1 RCBT's using pump WDL-P-5A or 5B. For more details, see response to Specific Comment #3. In addition to these procedures, there will be an overall directive procedure which would implement this sequence of transfer (see response to Specific Comment #2).

b. The amount of water transferred to Unit 1 and the restrictions imposed on the sequence of transfer will depend on the Unit 1 operating conditions at the time of the transfer. It is believed that conditions requiring an emergency transfer of containment sump water out of the Reactor Building would develop over a sufficiently long time period to permit Unit 1 personnel to process water that might be stored in the U-1 RCBT's at the time. The time required to process the contents of one of the three tanks would be ten days. Should all tanks be filled, although unlikely, the total process time would then be 30 days; however, other interim means may be employed to reduce this time considerably if necessary.

Specific Comments: Page 2 (middle)

7. a. For locations identified provide the current status. In the event that transfer of sump water is required, how much time would be required to make space available?

b. How much reserve capacity would this plan set aside in Unit 2 to take care of in-leakage?

c. At what point, and at what storage location inventory, will a decision be made to transfer water to Unit 1?

Response:

a. The contents of Unit 2 RCBT and the Tank Farm in the "A" Spent Fuel Pool is kept by a status log as identified in the response to General Comments. As of April 22, 1981, there are:

1) 78,860 gallons in the RCBT's, Unit 2,

2) the Tank Farm is empty,

3) 53,375 gallons in the RCBT's, Unit 1,

4) the "A" Spent Fuel Pool contains no water.

b. Total capacity of storage as described by the Contingency Plan is 908,750 gallons (including U-1 RCBT's). Assuming the current volume of water to be transferred from the Reactor Building is 600,000 gallons, a reserve capacity of 308,750 gallons is available for in-leakage. (See Specific Comment #5). If the volume of the U-1 Bleed Hold-Up Tanks is removed from this quantity, the reserve capacity is approximately 60,000 gallons.

c. Should a situation arise that requires implementation of the Contingency Plan, every effort would be made to utilize Unit 2 tankage to avoid impacting Unit 1. Should the situation require use of Unit 1 tankage, then the decision would be made at that time to use Unit 1 tankage. See Specific Comment #2.

Specific Comments: Page 2 - #2 (at bottom)

8. Identify equipment and instrumentation in storage location cubicles that would require maintenance.

Response

Each of the three RCBT's have level switches and sight glasses that may require maintenance should a failure occur. The transmission instrumentation and detectors are located on panels outside of these cubicles with the instrumentation tubing routed into the cubicles to each tank. Should these items develop leaks, it may be necessary to perform maintenance.

Specific Comments: Page 3 - first full paragraph

9. After the transfer of sump water, what is the expected volume of flush water that would be required? Where will the flush water be transferred to?

Response

Due to the lack of hard data on the effectiveness of flushing pipes that have contained this type of contaminated Reactor Building sump water, only an estimate of required flushing water can be made at this time. Generally, 3-5 pipe volumes of water flowing at a turbulent velocity will sufficiently flush a contaminant from a pipe. Based on 5 pipe volumes but excluding the 14" Reactor Building Sump drain lines or the 10" Building Spray or Decay Heat lines located in the spray vaults and Decay Heat Pits, respectively, the following is estimated:

Reactor Building Water Transfer to:	Estimated Flush Water Volume (Gallons)
U-2, RCBTs via WG-P-1	900
U-2, RCBTs via DH-P-1A/1B	2000
U-2, "A" Spent Fuel Pool (piping only)	2600
Fuel Pool Waste Storage System	500
U-1, RCBTs	250*

*Value is based on transfer of water from U-2 RCBT to U-1 RCBT and does not include volume of flush water required for sump water transfer from the sump to U-2 RCBT's.

The flush water will be transferred to the same location as that of the sump water.

Specific Comments: Page 3 - Item #1

10. In your analysis, was credit taken for additional shielding that could be placed on top of the existing shielding?

Response

The analysis did not take credit for additional shielding that could be placed on top of the existing concrete slab. It is our opinion that 10 mrem/hr at the center of the shielding slab on the surface is not extremely limiting to the operations within the new fuel storage pit (SPC System) or the "B" Spent Fuel Pool (SDS).

However, the dose rate in the area of the transfer canal between the "A" and "B" Fuel Pools may be limiting to SDS construction activity in the event that sump water is required to be stored within the "A" Spent Fuel Pool. Presently a concrete block shield wall provides shielding for the Tank Farm in this area. However, free water contained in the "A" Pool will flow around this concrete shield and result in high exposure at the transfer canal seal plate.

Specific Comments: Page 3 - Item #1

11. To what level would airborne contamination increase as a result of storage of sump water in the Spent Fuel Pool? Identify the airborne contaminants and the possible extent of increased releases to the environment.

Response

During the period of time that containment sump water is stored within the Unit 2 "A" Spent Fuel Pool, a continuous release of tritium and dissolved gases will occur as the water evaporates and is directed into the plant exhaust ventilation. This release will not result in a violation of the plant Technical Specifications for releases from the plant. A calculation of the worst case evaporation rate from the "A" Spent Fuel Pool has indicated that approximately .047 gallons/minutes of water will be lost from the surface. This will result in a tritium concentration in the plant exhaust air of about 5.8×10^{-7} uCi/cc. Tritium is the most limiting isotope. Gaseous Krypton-85 has, essentially, been removed from the Reactor Building sump water through the purging process and was not considered.

As the water level drops in the Spent Fuel Pool, radioactive particulates may adhere to the sides, dry, and become airborne in the exhaust ventilation or possibly above the pool shield slab. These species will most likely include Cesium and Strontium, their daughters, and other less concentrated isotopes that are presently in the sump water. Due to the uncertainties involved, the extent to which airborne contamination will increase is not exactly quantifiable. Releases to the environment are expected to be minimal, however. Control of evaporation and subsequent airborne contamination can be achieved through the use of a plastic cover placed over the "A" Spent Fuel Pool to limit air flow across the surface of the water.