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June 13, 1985

TMI Program Office
Attn: Dr. B. J. Snyder
Program Director
US Nuclear Regulatory Commission
Washington, DC 20555

Dear Dr. Snyder:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Technical Evaluation Report for the
Defueling Water Cleanup System

Attached for your information is a revision to the Technical Evaluation Report for the Defueling Water Cleanup System (DWCS). This revision addresses the operation of those portions of the DWCS which are intended to be operated during the initial phase of the TMI-2 defueling effort.

Sincerely,

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

FRS/RDW/eml

Attachment

cc: Deputy Program Director - TMI Program Office, Dr. W. D. Travers

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TER 15737-2-G03-106 REV. 6

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TMI-2

DIVISION

TECHNICAL EVALUATION REPORT

FOR

Defueling Water

Cleanup System

COG ENG Gerald K Boldt DATE 11/1/84

RTR Edward T. Smith DATE 11/1/84

COG ENG MGR. C.L. Rid for RL DATE 11/1/84

NO	DATE	REVISIONS	BY	CHECKED	GROUP SUPERVISOR	MGR DESIGN ENGINEERING
6	6/8/85	Revised and Reissued for Use	JJZ	DV	EOS	CLR
5	6/20/85	Issued For Use	JJZ	DV	EOS	CLR
4	4/18/85	Issued For Use	JJZ	RDZ	EOS	CLR
3	1/10/85	Issued For Use	JJZ	DV	EOS	CLR
2	12/20/84	Issued For Use	JJZ	DV	EOS	CLR
1	12/7/84	Issued For Use	JJZ	DV	EOS	CLR
0	11/1/84	Issued For Use	JJZ	DV	EOS	CLR
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EPD 33812 10/84

Rev.	SUMMARY OF CHANGE
0	Initial issue November 1, 1984
1	Revised to incorporate system design changes and comments on Revision 0
2	Revised to incorporate comments on Revision 1
3	Revised to incorporate comments on Revision 2
4	Revised to reflect addition of relief valves at the outlets of the defueling filter canisters, deletion of fuel pool cleanup system boronometer and correction of minor typographical errors
5	Revised to correct and clarify description of low level alarm setpoints for fuel transfer canal
6	Revised to reflect the potential for operation of portions of the DWC system prior to the system being fully operational and to incorporate minor editorial changes

1.0 Introduction

1.1 General

The defueling water cleanup (DWC) system is designed to remove radioactive ions and particulate matter from the fuel transfer canal, spent fuel pool "A" and the reactor vessel. The majority of the particulate matter is removed by processing the water through nominal 0.5 micron rated sintered metal filters. The low micron rating of the filters will assure very low turbidity as well as reducing the particulate activity in the water.

Removal of the radioactive ions (i.e., soluble fission products) will be performed by processing a portion of the filter output through 4 x 4 liners (similar to those in use for EPICOR II) containing Zeolite, or the submerged demineralizer system (SDS).

The installation and operation of the DWC system will occur sequentially such that portions of the system may be operated prior to completion of the entire system. In addition, partial system operation may require temporary interconnection(s) with other plant systems which are not specifically described in this Technical Evaluation Report. Any such temporary modes of DWC system operation will be implemented in accordance with the safety criteria for the complete DWC system and will be bounded by the safety analyses described herein. 6

1.2 Scope

The scope of this document includes the operation of the DWC system, the components of the DWC system and its interfaces to existing systems and components. This technical evaluation report (TER) is applicable only during the recovery mode as the DWC system is a temporary system required to support recovery operations and will be removed or reevaluated prior to plant restart. Evaluation of safety concerns related to the filter canisters is not within the scope of this TER and will be addressed in Reference 8. Licensing of the ion exchangers for offsite shipments is outside the scope of this TER.

2.0 System Description

2.1 General

The DWC system is designed to process water from the reactor vessel, spent fuel pool, and fuel transfer canal. The system's major functions are given below.

a) The DWC system filters the water contained in the reactor vessel, the spent fuel pool, and the fuel transfer canal to remove suspended solids above a nominal 0.5 micron rating. This is done to maintain the clarity of the water to a 1 NTU (nephelometric turbidity unit) rating.

b) The DWC system removes soluble fission products from the reactor vessel, the spent fuel pool, and the fuel transfer canal (FTC) by demineralization of the water. This is done to reduce the dose contribution from the water.

3.2 Postulated System Failures

3.2.1 Reactor Vessel Cleanup System

3.2.1.1 Loss of Power

A loss of power to the entire system would simply shut the system down. A loss of power to the well pumps with an additional failure which results in simultaneous loss of level control in the ion exchangers would result in a flow mismatch. In this case, the system would be automatically shut down until power is restored. Loss of power to individual components would place that component in its safe mode. An air operated valve, for example, would fail to a position that ensures no damage to other components. 6

Loss of power to the control panel would cause the loss of all information and fail all control and solenoid operated valves. The system would be shutdown until power is restored.

3.2.1.2 Loss of Instrumentation/Instrument Air

Loss of a single instrument channel will result in the loss of indication for that channel and, for those channels that have control features a flow mismatch. This flow mismatch will result in an automatic shutdown of the affected portion of the system.

Loss of the internals indexing fixture (IIF) level indication system (bubbler) will result in an erroneous level indication which will be noted when compared with a redundant level indication system. Since this system has no control features, no adverse system conditions will result.

Loss of instrument air will take the individual components to their fail safe position. Flow mismatches induced by loss of air will result in automatic trips. Loss of air to the IIF level monitoring system will initiate a low air supply pressure alarm.

3.2.1.3 Filter Media Rupture

A failure of the filter media in the canister could potentially release fuel fines to the ion exchange portion of the system. A post filter is located downstream of both filter trains in the line to the inches below the water level. Also, isolation valves will be provided in the Westinghouse supplied piping which could be used to manually terminate the siphoning. Therefore, a maximum of approximately 3000 gallons of reactor vessel water would spill into the fuel transfer canal following a hose rupture. Approximately half of this water would be contained in the New Fuel Pit.

The recovery from these events would be accomplished by isolating the ruptured section and replacing the ruptured hose/pipe.

3.2.2 Fuel Transfer Canal/Spent Fuel Pool Cleanup System

3.2.2.1 Loss of Power

A loss of power to any portion of the system would shut that portion of the system down. Loss of power to individual components would place that component in its safe mode. An air operated valve, for example, would fail to a position that ensures no damage to other components. 6

3.2.2.2 Loss of Instrumentation/Instrument Air

Loss of a single instrument channel will result in the loss of indication for that channel and, for those channels that have control features a flow mismatch. This flow mismatch will result in an automatic shutdown of the affected portion of the system.

Loss of either the spent fuel pool or FTC level monitoring system will be noted when compared with the other. The readings should normally be the same since both water bodies are in communication via the fuel transfer tubes. Neither system has control features.

Loss of instrument air will take the individual components to their fail safe position. Flow mismatches induced by loss of air will result in automatic trips. Loss of air to the IIF level monitoring system (bubbler) will initiate a low air supply pressure alarm.

3.2.2.3 Filter Media Rupture

A failure of the filter media in the canister could potentially release fuel fines to the ion exchange portion of the system. Flow may be routed to DWC ion exchanger K-2 or to the SDS both of which have filters upstream to trap migrating fuel fines. Ion exchanger K-2 has a cartridge type filter in a critically safe