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U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Response To Request For Additional Information –
Technical Specification Change Request No. 286,
Emergency Feedwater Changes (TAC NO. MB3660)

Three Mile Island, Unit 1 (TMI Unit 1)
Facility Operating License No. DPR-50
NRC Docket No. 50-289

This letter provides additional information in response to NRC request for additional information dated May 23, 2002, regarding TMI Unit 1 Technical Specification Change Request No. 286, submitted to NRC for review on December 19, 2001. The additional information is provided in Enclosure 1.

No new regulatory commitments are established by this submittal. If any additional information is needed, please contact David J. Distel (610) 765-5517.

I declare under penalty of perjury that the foregoing is true and correct.

Very truly yours,

07-30-02
Executed On

Michael P. Gallagher
Director, Licensing & Regulatory Affairs
Mid Atlantic Regional Operating Group

Enclosure: Response to Request for Additional Information

cc: H. J. Miller, USNRC Administrator, Region I
T. G. Colburn, USNRC Senior Project Manager, TMI Unit 1
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ENCLOSURE

TMI UNIT 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
TECHNICAL SPECIFICATION CHANGE REQUEST No. 286
EMERGENCY FEEDWATER CHANGES

1. **NRC Question**

What is the minimum amount of time allowable for an individual to realign the valves to their operational positions in the event an EFW transient were to occur while performing this surveillance test? Also, please clarify: Using Figure 1 from the licensee's December 19, 2001, submittal as a basis, identify which valves require manual actions and the relative distances between them. Also, identify the transit time between valves and, how much time and effort are required for an individual to manually realign each valve.

Response

TMI Unit 1 does not have specific design or licensing basis requirements for the minimum allowable time for an individual to realign EFW valves. However, as discussed in the response to Question No. 3, evaluation has shown that the consequences of a failure to perform these actions would not lead to core damage.

TMI Unit 1 has evaluated the anticipated operator response time associated with an event of an EFW transient while surveillance testing was being performed. The Technical Specification 3.4.1.1.a (4) surveillance testing associated with the Technical Specification Change Request No. 286 is directed to either of two (2) principle surveillances: (1) In-Service Testing of either motor-driven EFW pump (conducted quarterly per ASME Section XI) which isolates both flow paths to a single steam generator, and (2) Heat Sink Protection System (HSPS) automatic initiation surveillance (conducted quarterly per Technical Specifications) which makes the turbine-driven and one motor-driven EFW pumps inoperable simultaneously.

IST Surveillance
The IST is conducted such that one pair of manual valves (EF-V-52A/D or EF-V-52B/C) isolates each of the two (2) flow paths to the steam generator. Only one flow path (of two available) must be opened to supply design basis flow rate to the steam generators. The two (2) available EFW pumps (turbine-driven and one motor-driven) remain aligned to the unisolated steam generator. IST testing of the turbine-driven EFW pump does not require the steam generator flow paths to be isolated.

Restoration of the EFW flow path to the isolated steam generator is estimated to be completed within four (4) minutes. This time estimate is based on the opening operation of one (1) of the two closed EF-V-52 manual isolation valves in one flow path, and operator proximity to the valves during testing. The steam generator flow path isolation valves (EF-V-52A/B/C/D) are gate valves, which provide significant flow capability before achieving full open conditions. Only one valve needs to be reopened to provide adequate EFW flow. Instructions for the restoration of the EFW flow paths to the isolated steam generator are contained in the affected surveillance.

HSPS Automatic Initiation Surveillance

During the HSPS automatic initiation logic testing, both the turbine-driven pump (TDP) and one of the motor-driven pumps (MDP) are made inoperable to prevent multiple equipment starts that would otherwise occur during the test sequence. The TDP steam supplies are isolated by manually blocking the air-actuated steam supply valves, which prevents valve opening and resultant turbine acceleration. The TDP is not expected to be placed into service promptly from the test configuration due to the multiple steps required.

The MDP is made inoperable during HSPS testing by either: 1) placing the control switch in pull-to-lock, or, 2) closing the pump discharge isolation valve EF-V-10A/B.

Restoration of the MDP from the pull-to-lock condition requires an estimated two (2) minutes. The estimate is based on the control room operator's proximity to the EFW controls located on the control room center console. The MDP is made available by placing the control switch to normal. Instructions for the restoration of the MDP from the pull-to-lock condition are contained in the HSPS surveillance.

Restoration of the MDP from the "discharge isolation valve closed" condition is estimated to be completed within three (3) minutes. The restoration time to respond and open the manual isolation valve is based on the location of the valve with respect to the operator position and observed operation during testing. The pump discharge isolation valves (EF-V-10A/B) are gate valves, which provide significant flow capability before achieving full open conditions. Instructions for the restoration of the MDP from the "discharge valve closed" condition are contained in the HSPS surveillance.

An updated Figure 1 is provided showing the EF-V-10A/B valves. The specific valves discussed below are highlighted to aid identification.

IST Surveillance

The IST testing isolation valves (EF-V-52A/B/C/D) are located in the motor-driven EFW pump room immediately adjacent to the associated pumps. The valves associated with each steam generator are within 20 feet of each other, have no interfering appurtenances in the path of travel for an operator, and are at an elevation convenient for operator manipulation. Isolation valves EF-V-52A/D are closed during testing of EF-P-2A with all components located in the EF-P-2A cubicle. Isolation valves EF-V-52B/C are closed during testing of EF-P-2B with all components located in the EF-P-2B cubicle.

The EF-V-52A/B/C/D valves operate easily with the installed handwheel. A pin like device is permanently attached to the handwheel to allow higher valve operating speeds. The handwheel is geared to the valve stem such that several dozen turns are required for the valve to be fully opened. Valve operation (from open to close or vice-versa) is

observed to take about one minute to complete during surveillance testing. The valves are gate valves, which provide significant flow capability before achieving full open conditions. No special tools or ladders are required to operate or reach the valve handwheels.

Based on the immediate proximity of the steam generator flow path isolation valves to the pump under testing, we would expect the travel time to the affected valve to be about 30 seconds.

HSPS Automatic Initiation Surveillance
The HSPS test isolation valve EF-V-10A is located immediately adjacent to MDP EF-P-2A and valve EF-V-10B is located immediately adjacent to MDP EF-P-2B. The operator would remain in the immediate proximity of the pump during testing, moving back several feet during the pump motor start/stop for personnel safety purposes.

The estimated restoration using the manual isolation valve is based on the position of the valve and observed operation during testing. The valve handle provides some resistance (e.g., does not free-wheel) resulting in about 1/4 full rotation of the handwheel with each effort. Valve operation (from open to close or vice-versa) requires multiple handwheel turns and is observed to take about one minute to complete during surveillance testing. The valves are gate valves, which provide significant flow capability before achieving full open conditions. No special tools or ladders are required to operate or reach the valve handwheels.

Based on the immediate proximity of the pump discharge isolation valves, we would expect travel time to the affected valve to be less than 30 seconds

2. **NRC Question**

What is the basis for determining that an individual can successfully and reliably accomplish the required actions in the minimum allowable time under conditions that simulate the real event? For example, during an EFW transient event, are there harsh environmental factors such as radiation, excessive heat, noise, etc., that would hamper an individual from performing the required manual valve realignment and, if there are impediments, have they been considered in determining whether an individual can perform the required actions?

Response

A high energy line break inside the Intermediate Building would directly impact the environment in which the EFW system and local operator are located. Operator action in response to these events is not expected or credited due to the rapid onset of harsh

environmental conditions. The two (2) HELB events affecting the Intermediate Building are a main steam line break (MSLB) and a feedwater line break (FWLB).

The MSLB is an overcooling event for the RCS until operator action from the control room isolates the affected steam generator. The EFW system is not required during the overcooling portion of a MSLB. Following steam generator isolation, the plant response would be similar to a loss of feedwater event, and one EFW MDP would be available without relying on manual operator action to realign the EFW system. As noted in Question No. 3 below, a loss of feedwater with one EFW MDP does not result in core damage.

The Feedwater Line Break (FWLB) is also discussed in Question No. 3 below, and one EFW MDP would be available without relying on manual operator action to realign the EFW system. One EFW MDP also provides sufficient flow to prevent core damage in the event of a FWLB.

3. **NRC Question**

What are the consequences if the individual fails to perform the actions (i.e., valve realignment) in the allotted time?

Response

TMI Unit 1 has not specifically analyzed design basis accidents assuming operator action to restore the motor-driven or turbine-driven pumps. TMI Unit 1 has analyzed several transients using one (1) MDP to both steam generators for acceptability under Generic Letter 81-14. The loss of feedwater (LOFW) and small break loss of coolant accidents (SBLOCA) were evaluated and determined that no core damage resulted from the minimum available EFW flow rate provided.

Comparison of the resultant EFW configuration during the MDP IST testing and the HSPS automatic initiation logic testing was conducted to determine the minimum available EFW flow without operator action. This comparison identified the minimum available EFW flow occurs when one (1) motor-driven pump is available to both steam generators (HSPS automatic initiation with one MDP available).

A qualitative review of the transients, which credit EFW for heat removal was conducted. The review determined the feedwater line break (FWLB) accident required assessment for potential impact. The qualitative assessment determined no core damage would result from the reduced EFW flow. With limited EFW flows provided, actuation of the high pressure injection (HPI) system to the reactor coolant system (RCS) prevents core uncovery and subsequent fuel damage. In the various FWLB events (e.g., inside containment, outside containment, etc.), HPI is started automatically, or manually

initiated by operator response to loss of sub-cooling margin. Manual operator action to restore any available EFW pump is directed from plant procedures during any transient.

The operator actions are to: 1) confirm EFW actuation when plant conditions indicate EFW is required (equipment is started/placed into service if not already operating) and, 2) increase primary-to-secondary cooling upon loss of sub-cooling margin.

The consequences of these limiting events (LOFW and SBLOCA) even if the individual fails to perform the required specified actions in support of an EFW actuation during performance of surveillance testing, are that no core damage is expected with the one EFW MDP available. These beyond design basis scenarios (LOFW or SBLOCA during EFW/HSPS surveillance testing) have been shown to not result in core damage with a minimum of one EFW MDP available. In recognition of the limited EFW capability during EFW/HSPS surveillance testing, the proposed TMI Unit 1 Technical Specification 3.4.1.1.a (4) includes a maximum allowed action time of 8 hours for conducting testing where two (2) of the three (3) EFW pumps are inoperable.

Other less limiting events were assessed for the potential impact of reduced EFW flow rate available. These other events were not impacted and did not result in core damage.

4. **NRC Question**

The licensee (page 4 of 6 of Attachment 1 of the December 19, 2001, submittal) defines the individual performing the EFW surveillance as follows:

> A dedicated qualified individual is defined in the revised Bases to be one who is involved exclusively with the EFW surveillance testing..."

However, the individual is not solely responsible for valve realignment but also has as his principle responsibility, EFW testing. The licensee, in its response, has changed the meaning of the term "dedicated" from its previous usage (see Attachment 3 of the licensee's December 19, 2001 submittal, the licensee's December 6, 2000, submittal, discussion on page 14 of 20). The individual, as described by the licensee in its December 19, 2001, submittal, is "designated," not "dedicated" because he has additional responsibilities relative to the function of valve realignment. Either term and set of responsibilities is appropriate, i.e., either the individual is "dedicated" exclusively to the valve manipulation, the action for which the licensee is seeking credit or, the individual is "designated" (i.e., can perform other tasks in addition to the principle task (which is valve realignment) such as EFW testing).

Response

TMI Unit 1 is revising the proposed "INSERT to Technical Specification Page 3-25 (of the hand markup)" from the December 19, 2001 submittal to state a "designated" qualified individual in lieu of a dedicated individual. This change is consistent with the originally submitted Technical Specification Change Request No. 286, dated December 6, 2000. Technical Specification Bases "INSERT to Page 3-26b (of the hand markup) Page 2 of 2" is also revised to state "involved in" in lieu of "dedicated". The revised marked up Technical Specification pages are included as Attachment 1 to this response. These changes clarify the extent to which the qualified individual assigned to realign flow path valves is permitted to participate in associated EFW activities. These changes have no effect on the safety evaluation and the no significant hazards consideration evaluation previously provided in the December 19, 2001 supplement to Technical Specification Change Request No. 286. Guidance from NEI 99-02 for crediting operator action to restore system function includes..."an operator in the main control room provided s(he) is in close proximity to restore the equipment"... The proposed bases clarification extends this latitude to the local operator. The local operator position and activity are constrained such that the operator's purpose is testing and restoration of EFW. Upon order from the control room, the operator would interrupt the EFW testing activity and realign the system. An operator actively engaged in EFW testing is maintaining a heightened awareness of EFW system status and maintaining communication with the main control room during EFW system testing, thus ensuring prompt EFW system availability in the event of an EFW demand during the test evolution.

The proposed change is consistent with the existing TMI Unit 1 Technical Specification requirement which originally intended the operator assigned to manual valve restoration be involved with EFW pump testing. The TMI Unit 1 Restart Report, NUREG-0680, June 1980, Section C, Item 1a.4.a states "The licensee has revised [the motor-driven pump IST] Surveillance Procedure 1300-3F for these pumps to include a statement that requires the operator *performing the test* (emphasis added) to be stationed at the manual valves and to be in communication with the control room while either valve is shut." Item 1a.7 states that, "Operator training in use of the revised EFW system surveillance procedures has been conducted by the licensee. The staff has reviewed the content of the training material on this subject and concludes that adequate training has been performed to ensure that the operators assigned to align the EFW system for periodic testing are aware of the requirement for timely realignment of the system on demand events."

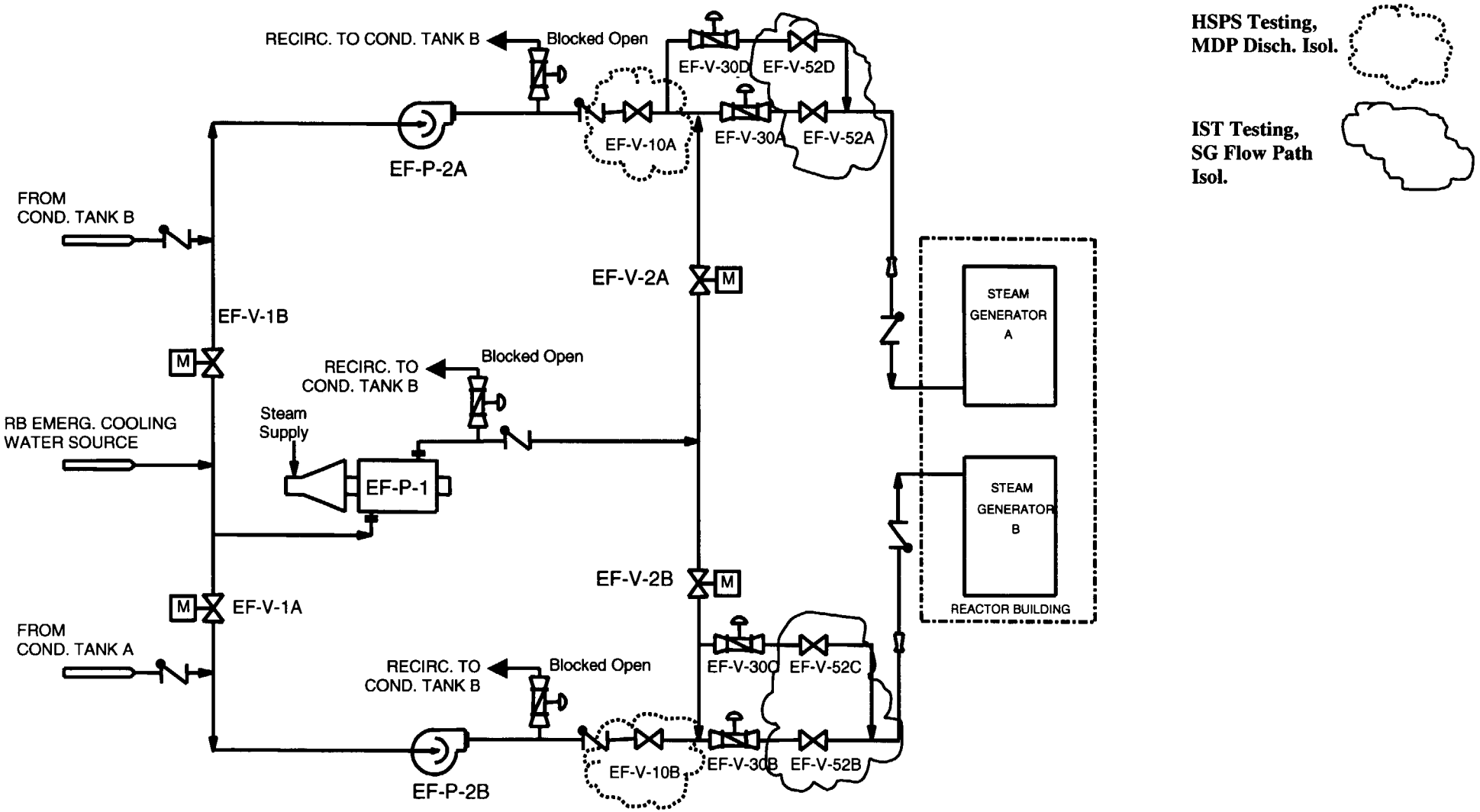
These NRC conclusions from NUREG-0680 support: (1) the LCA # 286 clarification that a designated operator can be involved in the EFW testing, and, (2) that operator training is adequate to ensure the timely realignment of the EFW system with no specified action time requirement. Technical Specification Change Request No. 103 (Amendment 78), supporting the Restart Report, revised the TMI Unit 1 Technical Specification to include the requirement that a designated operator would promptly realign the manual valves

from test to operational positions, further substantiating that there is no specified realignment acceptance criteria intended.

TMI Unit 1 has evaluated the plant risk associated with the EFW test configurations for which less than design basis EFW flow rates were available. Assessment of the core damage risk associated with EFW pump testing, available recovery methods, and limited period of testing (8 hours), concluded that use of "designated" qualified personnel was appropriate.

FIGURE 1 (Updated)

TMI Unit 1 Emergency Feedwater (EFW) System



ATTACHMENT 1

INSERT to Page 3-25
(of the hand markup)

(1) With one main steam supply path inoperable, restore the inoperable steam supply path to OPERABLE status within 7 days or be in COLD SHUTDOWN within the next 12 hours.

(2) With one EFW Pump or any EFW flowpath inoperable, restore the inoperable pump or flowpath to OPERABLE status within 72 hours or be in COLD SHUTDOWN within the next 12 hours.

(3) With one main steam supply path to the turbine-driven EFW Pump and one motor-driven EFW Pump inoperable, restore the steam supply or the motor-driven EFW Pump to OPERABLE status within 24 hours or be in HOT SHUTDOWN within the next 6 hours, and in COLD SHUTDOWN within the following 12 hours.

(4) With more than one EFW Pump or both flowpaths to either OTSG inoperable, initiate action immediately to restore at least two EFW Pumps and one flowpath to each OTSG.

Notes:

1. Specification 3.0.1 and all other actions requiring shutdown or changes in REACTOR OPERATING CONDITIONS are suspended until at least two EFW Pumps and one EFW flowpath to each OTSG are restored to OPERABLE status.

2. While performing surveillance testing, more than one EFW Pump or both flowpaths to a single OTSG may be inoperable for up to 8 hours provided that:

   (a) At least one motor-driven EFW Pump shall remain OPERABLE, and

   (b) With the reactor in STARTUP, HOT STANDBY, or POWER OPERATION, a designated qualified individual who is in communication with the control room shall be continuously stationed in the immediate vicinity of the affected EFW local manual valves. On instruction from the Control Room, the individual shall realign the valves from the test mode to their operational alignment.

INSERT to Page 3-26b
(of the hand markup)
Page 2 of 2

If EFW were required during surveillance testing, minor operator action (e.g., opening a local isolation valve or manipulating a control switch from the control room) may be needed to restore operability of the required pumps or flowpaths. An exception to permit more than one EFW Pump or both EFW flowpaths to a single OTSG to be inoperable for up to 8 hours during surveillance testing requires 1) at least one motor-driven EFW Pump operable, and 2) an individual involved in the task of testing the EFW System must be in communication with the control room and stationed in the immediate vicinity of the affected EFW flowpath valves. Thus the individual is permitted to be involved in the test activities by taking test data and his movement is restricted to the area of the EFW Pump and valve rooms where the testing is being conducted.

The allowed action times are reasonable, based on operating experience, to reach the required plant operating conditions from full power in an orderly manner and without challenging plant systems. Without at least two EFW Pumps and one EFW flowpath to each OTSG operable, the required action is to immediately restore EFW components to operable status, and all actions requiring shutdown or changes in Reactor Operating Condition are suspended. With less than two EFW pumps or no flowpath to either OTSG operable, the unit is in a seriously degraded condition with no safety related means for conducting a cooldown. In such a condition, the unit should not be perturbed by any action, including a power change, which might result in a trip. The seriousness of this condition requires that action be started immediately to restore EFW components to operable status. TS 3.0.1 is not applicable, as it could force the unit into a less safe condition.

The EFW system actuates on: 1) loss of all four Reactor Coolant Pumps, 2) loss of both Main Feedwater Pumps, 3) low OTSG water level, or 4) high Reactor Building pressure. A single active failure in the HSPS will neither inadvertently initiate the EFW system nor isolate the Main Feedwater system. OTSG water level is controlled automatically by the HSPS system or can be controlled manually, if necessary.