

February 16, 1984

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of )  
 )  
METROPOLITAN EDISON COMPANY ) Docket No. 50-289  
 ) (Restart)  
(Three Mile Island Nuclear )  
Station, Unit No. 1) )

LICENSEE'S COMMENTS ON PROPOSED  
SOLUTION TO THE MAIN STEAM  
LINE RUPTURE DETECTION SYSTEM

In its Order of January 27, 1984 (unpublished) in this proceeding, the Commission identified the issues on which it had decided to take review of ALAB-729, 17 N.R.C. 814 (1983). One of those issues is "... whether the Licensing Board erred in delegating to staff responsibility for approving licensee's solution to the main steam line rupture detection system problem." Order at 3. Noting that Licensee has already submitted its proposed solution to the Staff, which approved it, the Commission provided the opportunity to the parties to comment, within twenty days from the date of the Order, on the adequacy of that proposed solution. Id.

The Appeal Board imposed the condition that "Licensee shall submit to the Commission prior to restart a proposed long-term solution to the steam generator bypass logic problem." ALAB-729, 17 N.R.C. at 895 (1983). In response to that holding, Licensee filed its proposed solution with the Commission on June 29, 1983. (For convenience, a copy

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of that filing is attached hereto.) Licensee is not aware of any response by another party to that June 29, 1983 filing.

As an update to its earlier submittal, Licensee advises the Commission that the Main Steam Line Rupture Detection switches located in containment will be environmentally qualified through replacement in June, 1984.<sup>1/</sup> Therefore, in the event of a main steam line rupture in containment, the pressure switches will be capable of performing their intended function. All components of the Main Steam Line Rupture Detection System located inside containment will then be environmentally qualified.

Respectfully submitted,

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Counsel for Licensee

Dated: February 16, 1984

<sup>1/</sup> Letter 5211-84-2038, Hukill to Stolz (February 10, 1984).

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Station, Unit No. 1)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "Licensee's Comments on Proposed Solution to the Main Steam Line Rupture Detection System" with attachment were served this 16th day of February, 1984, by deposit in the U.S. mail, first class, postage prepaid, upon the parties on the attached Service List.

*Thomas A. Baxter*

Thomas A. Baxter, P.C.

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of

METROPOLITAN EDISON COMPANY

(Three Mile Island Nuclear  
Station, Unit No. 1)

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Docket No. 50-289  
(Restart)

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NUCLEAR REGULATORY COMMISSION

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METROPOLITAN EDISON COMPANY	)	Docket No. 50-289
	)	(Restart)
(Three Mile Island Nuclear	)	
Station, Unit No. 1)	)	

LICENSEE'S PROPOSAL IN RESPONSE TO  
ALAB-729, CONDITION NO. 5

In its decision on design issues, the Atomic Safety and  
Licensing Appeal Board imposed the following condition:

Licensee shall submit to the Commission  
prior to restart a proposed long-term  
solution to the steam generator bypass  
logic problem. See pp. 163-64, supra.

ALAB-729, 17 N.R.C. \_\_\_\_, slip op. at 176 (May 26, 1983).

Licensee herein submits its proposal in response to Condition  
No. 5 of the Appeal Board's decision.

The Licensing Board Decision

The reliability of the emergency feedwater ("EFW") system  
at TMI-1 was the subject of extensive inquiry through Licensing  
Board Question No. 6.<sup>1/</sup> See LBP-81-59, 14 N.R.C. 1211, 1353-1375  
(1981). One of the Licensing Board's concerns was for inad-  
vertent isolation of feedwater by the steam line rupture  
detection system. Therefore, the Licensing Board required

<sup>1/</sup> No party raised EFW reliability as a contested issue. Once  
raised by the Licensing Board, however, UCS pursued the matter  
with cross-examination, proposed findings of fact, and appeals.

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. . . that prior to restart, the Licensee propose for Staff approval, a long-term solution to the steam generator bypass logic problem for implementation as soon as possible after restart. Prior to restart, the Staff shall certify to the Commission that the Licensee has made reasonable progress in initiating its program for the long-term solution.

Id. at 1374 (§ 1064).

In response to the Licensing Board condition, Licensee submitted to the Staff on August 2, 1982, a description of the modifications made to the Main Steam Line Rupture Detection System ("MSLRDS") and to the EFW System in order to prevent an inadvertent isolation of feedwater flow to the steam generators. See Attachment A hereto. In short, Licensee's proposed solution was to add cavitating venturis to the EFW System and to delete the MSLRDS signal to the EFW system.

The Staff has reviewed Licensee's proposal and, on November 10, 1982, issued a Safety Evaluation finding that the proposed modification is acceptable and satisfies the Licensing Board condition. See Attachment B hereto.

#### The Appeal Board Decision

Condition No. 5 of ALAB-729, quoted above, appears to repeat the Licensing Board condition that Licensee propose a long-term solution to the steam generator bypass logic problem, but requires that Licensee submit its proposal to the Commission rather than to the Staff. See ALAB-729, slip op. at 162-164. Licensee hereby submits its proposed long-term solution, previously reviewed and approved by the

Staff, to the Commission and requests that the Commission affirm the Staff's finding that the Licensing Board's condition has been satisfied.<sup>2/</sup>

While the condition imposed by the Appeal Board only requires Commission, rather than Staff, review of Licensee's proposal, elsewhere in its decision the Appeal Board "recommends" that prior to acceptance of Licensee's proposal, the potential for containment overpressurization as a result of MSLRDS failure be evaluated. ALAB-729, slip op. at 36, n.59. Of course, Licensee's proposal addresses this concern with respect to emergency feedwater isolation. The Appeal Board raises for the first time, however, its concern for overpressurization of containment if the MSLRDS fails to isolate main feedwater during a steam line break accident. Id. This concern is clearly unrelated to the Licensing Board's concern for inadvertent feedwater isolation, and goes beyond the scope of the proceeding.<sup>3/</sup> Accordingly, the Appeal Board's recommendation should be left for Staff consideration outside of the restart proceeding<sup>4/</sup> and

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<sup>2/</sup> In response to an exception by UCS challenging the Licensing Board's delegation to the Staff of responsibility to review Licensee's proposal and certify reasonable progress to the Commission, Licensee argued that the Staff's assigned task here was fully consistent with its designated role in the certification process established in the Commission's August 9, 1979 Order and Notice of Hearing. See Licensee's Brief in Opposition to the Exceptions of Other Parties to the Atomic Safety and Licensing Board's Partial Initial Decision on Plant Design and Procedures, Separation, and Emergency Planning Issues, at 116-119 (May 10, 1982).

<sup>3/</sup> The Appeal Board recognized that a main steam line break accident is outside its purview. ALAB-729, slip op. at 88.

<sup>4/</sup> For example, Licensee's probabilistic risk assessment for TMI-1 would provide an appropriate means for evaluating the scenario posed by the Appeal Board.



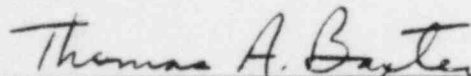
should not be a consideration for lifting the suspension of the TMI-1 license.

Conclusion

Licensee has proposed, and in fact already implemented, a solution to the concern raised by the Licensing Board. Pursuant to the Appeal Board's condition, Licensee submits its proposal, already approved by the Staff, to the Commission. The Appeal Board's new recommendation for a further evaluation of the potential for containment overpressurization during a main steam line break accident should not be a condition of restart.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

  
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Thomas A. Baxter, P.C.

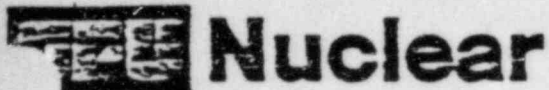
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Dated: June 29, 1983

Aug 1982



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Writer's Direct Dial Number

August 2, 1982  
5211-82-153

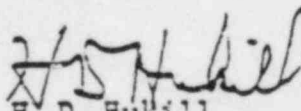
Office of Nuclear Reactor Regulation  
Attn: John F. Stolz  
Operating Reactors Branch No. 4  
Division of Licensing  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Dear Sir:

Three Mile Island Nuclear Station, Unit 1 (TMI-1)  
Operating License No. DPR-50  
Docket No. 50-289  
Main Steamline Rupture Detection System Design Changes

In its Partial Initial Decision (PID) on design (See PID 1060-1064) the Atomic Safety and Licensing Board (ASLB) required that GPUN investigate design changes to the Main Steamline Rupture Detection System (MSLRDS). The changes are to prevent unnecessary isolation of feedwater under single failure conditions. A description and evaluation of the changes to the MSLRDS is attached. This is submitted for NRC approval as requested by the ASLB (PID 1064).

Sincerely,

  
H. D. Hukill  
Director, TMI-1

HDB:CWS:vjf

Attachment

cc: R. C. Haynes  
R. Jacobs

"ATTACHMENT A"

## Main Steamline Rupture Detection System Design Changes

I. INTRODUCTION

The Main Steamline Rupture Detection System (MSLRDS) is actuated on low steam generator pressure (below approximately 600 psig) and automatically closes the Emergency Feedwater (EFW) and Main Feedwater (MFW) control valves to isolate feed flow to the depressurized steam generator. If subsequently pressure rises above 600 psig in a steam generator the EFW associated with that steam generator is restored. This MSLRDS action prevents overpressurization of containment from steamline breaks in containment. The ASLB was concerned that the MSLRDS would block all feedwater, including EFW, to the steam generators in certain scenarios when it should not be blocked.

II. SOLUTION

The proposed solution to the above concern consists of the addition of cavitating venturis and the deletion of the MSLRDS signal to the Emergency Feedwater System. Low OTSG pressure, which actuates the MSLRDS, can result from either a severe overcooling or a main steamline break event. The original design required operator action to bypass MSLRDS to prevent a loss of heat sink if a low OTSG pressure condition developed and single failure then blocked EFW. The addition of the cavitating venturis to the EFW System and removal of the MSLRDS from the EFW valves eliminates operator action to provide EFW to the intact OTSG in the event of a single failure. Since the venturis also limit EFW flow, the MSLRDS is no longer required for EFW and need not be up graded to safety grade (PID 1037a) since it is eliminated.

III. SAFETY EVALUATION

Deletion of the MSLRDS from the EFW valves does not affect any of the FSAR acceptance criteria. The basis for this judgment is as follows:

The MSLRDS was installed to prevent overpressurization of the containment due to a Main Steamline Break (MSLB). Removal of the MSLRDS from the EFW valves will make TMI-1 feedwater isolation functionally the same as TMI-2 in its response to a MSLB. The TMI-2 MSLB analysis was reviewed and approved by the NRC (See TMI FSAR, Chap. 15, Appendix B). The TMI-2 analysis is bounding for TMI-1 for the following reasons:

- a) The TMI-1 venturis limit total flow to a lower flow rate than the TMI-2 venturis (1150 GPM vs. 1250 GPM), and
- b) TMI-1 cannot have a double OTSG blowdown in containment (limiting pressurization accident for TMI-2) because the main steam isolation valves are stop check valves for TMI-1.

Deletion of the MSLRDS from the EFW valves does not increase the probability of occurrence of a steamline break accident. The consequences of the accident, as analyzed in the TMI-2 FSAR, have not been increased,

Reactor Building overpressurization does not occur and the required heat removal capability to prevent fuel damage is provided. Specifically, fuel damage will not result, off-site doses will not be increased, and steam generator tube integrity will not be compromised. The conclusions are confirmed in the Restart Report, Section 8.3.9 which references the TMI-2 FSAR, Chapter 15, Appendix B. EFW flow is continued throughout the referenced analysis. Addition of cavitating venturis to the EFW system limits the maximum EFW flow at TMI-1 and assures that the referenced TMI-2 analysis is bounding for TMI-1. Furthermore, the systems, setpoints and/or plant conditions that are utilized in the referenced analysis are applicable to both TMI-1 and TMI-2. (The NRC was also advised of the TMI-1 design modification in Met-Ed response to IE Bulletin 80-04 May 9, 1980 TLL 228).

The referenced TMI-2 analysis assumed IXAK/X shutdown margin and demonstrated that the core does not return to criticality and that the fuel rods do not violate a DNBR of 1.0. Other assumptions made in the referenced analysis are more severe than those allowed by TMI-1 Tech. Specs., most notably power level (2772 MW), and RCS flow (100%). The design peaking factor of 1.78 used in TMI-2 analysis exceeds the current design peaking factor for TMI-1. The referenced steamline break analysis also demonstrated acceptable offsite doses and showed that OTSG tube stresses resulting from the accident are acceptable. Tube stress conditions were evaluated in BAW-1588. The results of this evaluation bound the TMI-1 EFW system design with the MSLRDS signal deleted from the EFW valves.

Other considerations and/or questions:

Overfilling of the OTSG is an issue which has been raised and is documented in the Restart Report, Supplement 1, Part 2, Question 2. The analysis presented in the TMI-1 FSAR did not take credit for EFW isolation via the MSLRDS signal. The EFW flow rate assumed was 1500 GPM to one (1) OTSG at 600 PSIG (the MSLRDS set point), this assumed flow is 2-1/2 times the flow rate available to one (1) OTSG from the TMI-1 EFW system with cavitating venturis installed.

Filling of the OTSG from the 50% operating range took 6.6 minutes using these assumptions. Therefore, the operator would have (with the venturis installed and a fully opened control valve) approximately 16 minutes to terminate an overfill condition due to EFW flow. The revised design therefore allows sufficient time for the operator to terminate EFW.

As discussed above, deletion of the MSLRDS signal to the EFW valves does not introduce any accident or malfunctions not previously evaluated, nor does it increase the likelihood of occurrence or consequences of any accident analyzed in the TMI-1 FSAR.

In conclusion, this modification does not introduce any accident or malfunctions not previously evaluated, nor does it increase the likelihood of occurrence or consequences of any accident as analyzed in the TMI-1 FSAR. No safety margins will be reduced as a result of the modification. Furthermore, the revised design improves the reliability of the EFW System to deliver flow to the intact OTSG and will not create a containment overpressurization or OTSG overfill condition.





UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

"ATTACHMENT B"

November 10, 1982

Docket No. 50-289

Mr. Henry D. Hukill  
Vice President  
GPU Nuclear Corporation  
P. O. Box 480  
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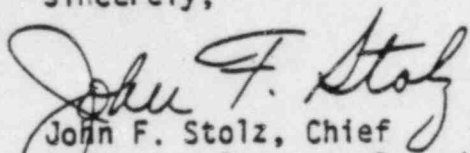
Dear Mr. Hukill:

In its Partial Initial Decision (PID) on design issues, dated December 14, 1981, the Atomic Safety and Licensing Board (ASLB) for the TMI-1 restart proceeding specified that GPUN propose for staff approval a long term solution to the problem of the Main Steam Line Rupture Detection System (MSLRDS) isolating all EFW flow in the event of a failure (paragraph 1064). The Board also specified that the staff review your solution and certify to the Commission that you have made reasonable progress in initiating the solution.

The staff has reviewed your submittal dated August 2, 1982 wherein you propose the addition of cavitating venturis in the EFW lines and subsequent removal of the MSLRDS signal from the EFW valves. We find your proposed solution acceptable. We understand that this modification has been completed. Hence, the Board condition as specified in paragraph 1064 is satisfied.

Our Safety Evaluation is enclosed.

Sincerely,

  
John F. Stolz, Chief  
Operating Reactors Branch #4  
Division of Licensing

Enclosure:  
Safety Evaluation

cc w/enclosure:  
See next page

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THREE MILE ISLAND NUCLEAR STATION, UNIT NO. 1

DOCKET NO. 50-289

Introduction

The TMI-1 Main Steam Line Rupture Detection System (MSLRDS) which is actuated by low steam generator pressure (below approximately 600 psig), automatically closes valves in the Emergency Feedwater (EFW) system and Main Feedwater system to isolate feed flow to the affected once through steam generator (OTSG). Because of the Board's concern that a failure of the MSLRDS could isolate all EFW flow, the Board specified that the licensee propose for staff approval, a long term solution to this problem for implementation as soon as possible after restart (ASLB PID dated December 14, 1981, paragraph 1064). The Board also specified that the staff certify to the Commission that the licensee has made reasonable progress in initiating the long term solution. By letter dated August 2, 1982, the licensee proposed its solution to the above problem.

Discussion and Evaluation

The licensee's proposed solution to the above problem consists of the addition of cavitating venturis in the EFW lines and then removal of the MSLRDS signal to the EFW isolation valves. In order to justify removal of the MSLRDS signal from the EFW isolation valves, it must be demonstrated that the protection for which this signal is needed (namely a main steam line break event) is no longer required. Other conditions such as effect on steam generator overfill also require consideration.

It is the licensee's position that deletion of the MSLRDS signal from the EFW valves does not affect any of the FSAR acceptance criteria. The licensee provides the following basis for this position. The MSLRDS was installed to prevent overpressurization of containment due to a Main Steam Line Break (MSLB). Removal of the MSLRDS signal from the EFW valves will make the TMI-1 feedwater isolation functionally the same as TMI-2 in its response to a MSLB. The TMI-2 MSLB analysis was previously reviewed and approved by the NRC and the TMI-2 analysis is bounding for TMI-1 for the following reasons:

- a) The TMI-1 venturis limit total flow to a lower flow rate than the TMI-2 venturis (1150 GPM vs 1250 GPM), and
- b) TMI-1 would not be subjected to a double OTSG blowdown in containment (the limiting pressurization event for TMI-2) because the TMI-1 main steam isolation valves are stop check valves.

The staff recently completed a review of the licensee's analysis of a main steam line break with continued feedwater addition on TMI-1 in response to IE Bulletin 80-04. The staff's evaluation which was issued July 21, 1982, concluded that there was no potential for containment overpressurization resulting from a MSLB with continued emergency (auxiliary) feedwater addition because the main feedwater system isolates and emergency feedwater flow restrictors (cavitating venturis) limit flow to the affected steam generator. It was also concluded 1) that EFW pumps will not experience runout conditions and thereby be damaged, 2) that no return to criticality occurs and 3) the DNBR ratio remains greater than 1.3 in the event of a MSLB with continued EFW flow. Hence, the staff concludes that removal of the MSLRDS signal from the EFW valves will not adversely affect the ability to withstand a MSLB.

With regard to a steam generator overfill concern, the licensee had previously provided a steam generator overfill analysis (supp. 1, part 2, question 2, Restart Report) which with the conservative assumptions of 1) flow through all three EFW pumps directed to one OTSG, 2) no EFW flow restrictors installed, and 3) the control valve fails full open and no credit is taken for the MSLRDS signal to isolate EFW on low OTSG pressure; indicated approximately 10 minutes (assumed best estimate EFW boiloff) was available for operator action before OTSG level would reach the top of the shroud from an initial level of 50% on the operating range. The licensee calculated that a minimum of 6.6 minutes would be available for the operator to take action if a conservative rate of EFW boiloff were assumed.

The staff reviewed this analysis and the options available to the operator to terminate the overfill condition and concluded that operator action could be performed in the time available (NUREG-0680, p 1-2). With the addition of the cavitating venturis, maximum EFW flow would be reduced by a factor of 2 1/2 resulting in fill times approximately 2 1/2 times those previously analyzed, or 25 minutes for the best estimate boiloff assumption of 16 minutes for the conservative boiloff assumption. Hence, since additional time would be available for operator action with cavitating venturis, we conclude that the proposed modification to remove the MSLRDS signal of EFW valves will not adversely affect the ability to control an overfill transient.

#### Conclusion

Because the deletion of the MSLRDS signal from the EFW valves does not affect the ability to withstand a MSLB accident and because, with the addition of cavitating venturis in the EFW lines, sufficient time is available for the operator to terminate an overfill condition due to continued EFW addition, we conclude that the proposed modification is acceptable and satisfies the Board's condition in paragraph 1064 of the December 14, 1981 ASLB PID.

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of )

METROPOLITAN EDISON COMPANY )

(Three Mile Island Nuclear  
Station, Unit No. 1) )

) Docket No. 50-289  
) (Restart)  
)

CERTIFICATE OF SERVICE

I hereby certify that copies of "Licensee's Proposal in Response to ALAB-729, Condition No. 5" were served this 29th day of June, 1983 by deposit in the U.S. mail, first class, postage prepaid, to the parties on the attached Service List.

Thomas A. Baxter  
Thomas A. Baxter, P.C.

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