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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
H. D. Hukill
Director, TMI-1

HDH:CWS:vjf

Attachment

cc: R. C. Haynes
R. Jacobs

A001

ATTACHMENT 1

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 1037e) 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 Streamline 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-2 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 1%ΔK/K 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 2-½ time 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.