February 16, 1983

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

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

LICENSEE'S TESTIMONY OF

ROBERT C. JONES, JR., AND LOUIS C. LANESE

IN RESPONSE TO

ALAB-708 ISSUE NO. 9

(RELIANCE ON FEED AND BLEED COOLING)

SUMMARY

This testimony is in response to the Appeal Board's request that Licensee and the Staff set forth the conditions for which feed and bleed cooling will be relied upon at TMI-1. The testimony confirms Licensee's previously stated position that feed and bleed cooling is only required for those beyond design basis events involving an extended loss of both main and emergency feedwater. This testimony also shows that the TMI-1 safety valves are capable of successfully relieving two-phase flow.

INTRODUCTION

This testimony, by Robert C. Jones, Jr., Supervisory Engineer, Operational Analysis Unit, Babcock & Wilcox Company, and Louis C. Lanese, Senior Safety Analysis and Plant Control Engineer, GPU Nuclear Corporation, is addressed to Issue No. 9 of the Appeal Board's Memorandum and Order of December 29, 1982 (ALAB-708), which states:

> 9. Whether and under what circumstances reliance on feed and bleed is necessary at TMI-1 (from the licensee and the staff).

This testimony will also respond to the concerns expressed by the Appeal Board at page 39 of ALAB-708, regarding the ability of the TMI-1 pressurizer safety valves to successfully pass two-phase flow, and the resultant effects on feed and bleed cooling capability.

RESPONSE TO ISSUE NO. 9

BY WITNESS JONES:

The feed and bleed method of providing core cooling -- utilizing the High Pressure Injection System (HPI) to "feed" water to the Reactor Coolant System (RCS) and "bleeding" the water from the RCS through the pressurizer relief (PORV) and/or safety valves -- is an additional method of providing forced cooling which would be used as a defense in depth procedure for events beyond the design basis.

In the event of a loss of main feedwater transient, with or without a concurrent small-break LOCA, actuation of emergency feedwater (resulting in automatic actuation of HPI) or actuation of HPI within approximately 20 minutes will assure adequate heat removal through the steam generators.1/ It is only for those beyond-design-basis events, involving an extended loss of both main and emergency feedwater, that feed and bleed would be required to remove decay heat from the primary system.2/

The feed and bleed mode of core cooling has been thoroughly analyzed by B&W in conjunction with the additional small-break LOCA analyses performed following the TMI-2 accident. The scenarios analyzed included: (a) a loss of all feedwater (main and emergency) with a single failure in the HPI system, (b) a loss of all feedwater coincident with small breaks of various sizes (0.07 ft2, 0.02 ft2, 0.01 ft2), and (c) a loss of all feedwater with a very small break (0.01 ft2) and with a subsequent PORV failure. (These analyses are summarized

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1/ For small-break LOCAs greater than approximately 0.02 ft2, secondary side heat removal is not required, as the break itself is large enough to remove the core decay heat. In addition, automatic actuation of HPI will occur for these break sizes.

2/ In this case, the inventory injected by the HPI is used to assure the core is covered by liquid coolant or a two-phase mixture and thus adequately cooled, while the water discharged through the PORV or safety valves removes the energy added to the primary system by the core.

in Tables 2, 3 and 8 of Licensee's Testimony of Robert C. Jones, Jr., and T. Gary Broughton in Response to UCS Contention No. 8 and ECNP Contention No. 1(e), ff. Tr. 5038, and at Tr. 5064-73, 5074-87 and 5103-04 (Jones).) Initiation of HPI -- and thereby initiation of the feed and bleed mode -- within approximately 20 minutes (for those cases where the ESFAS setpoint is not reached) assures the provision of adequate core cooling.

BY WITNESS LANESE:

At page 39 of ALAB-708, the Appeal Board has requested information concerning the ability of the TMI-1 safety valves to pass two-phase flow and the effect that this ability may have upon the TMI-1 plant's capability to achieve feed and bleed cooling. GPU Nuclear, in conjunction with other participating utilities, sponsored a program to test safety and relief valves. The test program was conducted through the Electric Power Research Institute (EPRI). The valves tested included the same model Dresser safety and relief valves used at TMI-1. The EPRI test program was the subject of testimony presented before the Licensing Board in response to Board Questions on UCS Contention 6. See Correa, et al., ff. Tr. 8746, and Zudans, ff. Tr. 8824.

The results of those tests showed that the pressurizer relief valve was acceptable for the range of operation at

TMI-1, including feed and bleed cooling under both steam and liquid relief conditions. The safety valves were shown to be acceptable under all modes of operation after certain modifications were made.

First, the safety valve inlet piping has been changed from a long inlet to a short inlet arrangement. Test results indicated that valve instabilities could occur for the long inlet arrangement in situations where the valve was discharging water from the loop seal.

Second, the TMI-1 safety valve settings were revised to allow blowdown of no more than 20% (versus the previous blowdown of 3%). This increased blowdown eliminates valve instabilities that were detected for both steam and water flow situations.

Four tests were performed in which the TMI-1 model safety valves were required to relieve liquid. One test was a transition from steam to liquid, and three tests were liquid flow tests. In the transition case and two liquid flow cases, the valve flow rate met the test acceptance criteria. In the final liquid flow case, pressure in the test loop was not controlled by the valve; however, the valve flow rate (550,000 lbm/hr) achieved during the test exceeded the requirements for controlling pressure and cooling the core at TMI-1. All four cases demonstrated that the pressurizer safety valves are suitable for operation in the feed and bleed mode of cooling at

TMI-1. Moreover, the results confirmed the analysis provided in Licensee Exhibit 9 (the B&W analysis of feed and bleed cooling).

ROBERT C. JONES, JR.

Business Address: Babcock & Wilcox Company
Nuclear Power Generation Division
Post Office Box 1260
Lynchburg, Virginia 24505

Education: B.S., Nuclear Engineering, Pennsylvania State University, 1971. Post Graduate Courses in Physics, Lynchburg College.

Experience: July 1982 to present: Supervisory Engineer, Operational Analysis Unit, B&W. Responsible for the performance of plant transient analyses and analyses used in the development of operator guidelines. During this period, has continued as Project Engineer for B&W analyses performed in response to NUREG-0737 Item II.K.3.30.

June 1975 to July 1982: Acting Supervisory Engineer and Supervisory Engineer, ECCS Analysis Unit, B&W. Responsible for calculation of large and small break ECCS evaluations, evaluations of mass and energy releases to the containment during a LOCA, and performance of best estimate pretest predictions of LOCA experiments as part of the NRC Standard Problem Program. Involved in the preparation of operator guidelines for small-break LOCA's and inadequate core cooling mitigation.

June 1971 to June 1975: Engineer, ECCS Analysis Unit, B&W. Performed both large and small break ECCS analyses under both the Interim Acceptance Criteria and the present Acceptance Criteria of 10 CFR 50.46 and Appendix K.

LOUIS C. LANESE

Business Address: GPU Nuclear Corporation
100 Interpace Parkway
Parsippany, New Jersey 07054

Education: B.S., Engineering Science, Newark College of Engineering, 1970, M.E., Nuclear Engineering, New York University, 1972. Nuclear Engineering courses, Polytechnic Institute of New York, 1975 to 1980. Completed course work for Degree of Engineer.

Experience: Senior Safety Analysis and Plant Control Engineer, GPU Nuclear Corporation, 1979 to present. Responsibilities include the performance of the TMI-1 Restart Safety Analysis; TMI-1 Emergency Feedwater design, design review of TMI-1 restart and long-term modifications. Member of TMI-2 Generation Review Committee (GRC), 1979 through June 1982. Member of TMI-1 GRC, 1979 to present.

Chairman of the Babcock & Wilcox Owners Group Analysis Subcommittee from May 1981 to July 1982. Currently a member of the Analysis Subcommittee. Member of the GPUNC inhouse committee responsible for implementing the Abnormal Transient Operating Guidelines (ATOG) at TMI-1. Currently working on improvement of steam generator tube rupture emergency procedures, including analyses of tube rupture events using the RETRAN computer code. Working with EPRI in benchmarking RETRAN with RELAP 5 for tube rupture events. Independent safety reviewer for emergency procedures from August 1982 to present.

Control and Safety Analysis Engineer, GPU Service Corporation, 1978 to 1979. Responsibilities included the performance of containment analyses in support of plant operation; developing analyses in support of the TMI-2 feedwater system modification; preparation of the TMI-1 restart safety analysis.

Lead Nuclear Licensing Engineer, GPU Service Corporation, 1977 to 1978. Primary responsibility for TMI-2 licensing activities and for licensing matters involving generic safety issues affecting all GPU system plants.

Safety and Licensing Engineer, GPU Service Corporation, 1974 to 1977. Responsibilities included technical resolution of TMI-2 licensing open items; conformance of Forked River systems design to licensing criteria; and, safety review of Oyster Creek radwaste facility.

Assistant Safety and Licensing Engineer, Ebasco Services, Inc., Performed licensing and safety review of St. Lucie Units 1 and 2 Safety Analysis Report pertaining to instrumentation and power systems; cooling water and HVAC systems, radwaste systems; and, accident analysis. Performed dose analyses and developed secondary system source terms.