

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

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BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

OFFICE OF SECRETARY  
DOCKETING & SERVICE  
BRANCH

In the Matter of )  
METROPOLITAN EDISON COMPANY )  
(Three Mile Island Nuclear )  
Station, Unit No. 1) )

Docket No. 50-289  
(Restart)

UNION OF CONCERNED SCIENTISTS' RESPONSE TO  
APPEAL BOARD MEMORANDUM AND ORDER OF NOVEMBER 5, 1982

Introduction

In its Memorandum and Order of November 5, 1982, the Appeal Board expressed its present view, agreeing with UCS, that the viability of feed and bleed has been called into question by the recent Semiscale tests. Even without the evidence of these tests, the Appeal Board indicated that the record does not support a conclusion that feed and bleed is a viable means of removing decay heat for TMI-1. Memorandum and Order, November 5, 1982, Sl. op. at 6. The Appeal Board noted that, without feed and bleed as a backup, natural circulation with heat removal via emergency feedwater is the only means of decay heat removal. Id. The so-called "boiler-condenser" mode of natural circulation has also not been adequately demonstrated. Id. at 7. All that remains is liquid natural circulation.

The record shows two critical problems with natural circulation. The first is related to the unreliability of emergency feedwater. Feedwater must be available to provide a heat sink for natural circulation. The second is

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that, even if feedwater is available, natural circulation will be stopped by the formation of steam bubbles for most small break LOCAs.

The Appeal Board suggested a possible alternative to reopening the record for resolution of these problems and sought the parties' views. As to the first problem, the Board suggested designating a dedicated operator to manually operate the emergency feedwater ("EFW") flow control valves. As to the second, it suggested pre-restart installation of hot leg high point vents as a means for removal of the steam bubbles. It is UCS's view that the current state of the record is insufficient to support a conclusion that these proposed changes would solve the problems recognized by the Appeal Board and that reopening is required.

#### Reliability of EFW

With respect to the question of control of emergency feedwater flow independent of the integrated control system, the Board notes that "[t]he presence of a safety-grade manual control capability is unclear from the record." Memorandum and Order, November 5, 1982, Sl. op. at 9, n.19. UCS believes that, on the basis of this record, the EFW manual control capability is not safety grade. There is only one flow control valve for each steam generator. In the event of a break in one steam generator, which causes isolation of that steam generator, a single failure of the other flow control valve would cause total loss of feedwater. See Licensee Exhibit 1 at 2.1-25. This is true whether control of EFW flow is manual or automatic. The long-term upgrade of EFW to safety grade requires installing two flow control valves in parallel for each steam generator. Wermiel and Curry, ff. Tr. 16,718 at 30 (Figure 1, TMI 1 EFWS).

We are aware that the Licensee now proposes to change the design of the plant so that EFW to a broken steam generator would not be isolated. H. D.

Hukill to John F. Stolz, August 2, 1982 (incorporated in Licensee's Response to Appeal Board order of July 14, 1982 at 20). The effect of this proposed change has not been evaluated on the record.

Moreover, the evidence shows, and the Licensing Board found, that the reliability of the emergency feedwater system itself, even after it is fully upgraded to safety grade, is not sufficient to provide the needed assurance of highly reliable decay heat removal. PID at Paragraph 1050 (Dec. 14, 1981). This was based on calculations of EFW failure rates which considered the presence of a dedicated operator to manually control EFW flow. Wermiel and Curry, ff. Tr. 16,718 at Attachment 2, fourth unnumbered page. Therefore, the Appeal Board's proposal to assign an individual to control EFW flow manually in the interim until EFW is safety grade would not result in making the delivery of EFW to the steam generators adequately reliable such that liquid natural circulation could be found an adequate means of removing decay heat (even assuming, arguendo, that the high point vents had successfully removed steam and/or noncondensable gases, thus making liquid natural circulation possible).

#### Hot Leg High Point Vents

The Appeal Board also proposes to require the installation of the hot leg high point vents as a means of removing the steam bubbles that will be formed for most small break LOCAs and which will stop liquid natural circulation. As the Board is aware, UCS believes that installation of these vents is necessary prior to restart. The question here, however, is whether an order requiring installation of the vents without reopening of the record is sufficient to ensure a highly reliable means of decay heat removal. The answer to this question is "no". There are too many critical unanswered questions on this record.

First, as the Staff testified at the oral argument before the Appeal Board, it is not clear that high point vents would be effective in restoring natural circulation.\*/ Calculations were apparently done at Los Alamos which predicted that once the candy cane at the top of the hot leg was voided, use of the vents would not restore circulation. Oral argument, September 1, 1982 at 290-292. Certainly, as the Staff seemed to recognize, a testing program would be required to verify the effectiveness of the high point vents for the purpose suggested by the Appeal Board. The record as it stands clearly does not support a conclusion that the vents would make natural circulation adequately reliable given the presence of steam voids.

Second, it appears likely that some of the same difficulties with feed and bleed demonstrated by the Semiscale tests S-SR-1 and S-SR-2 might also be encountered in attempting to "bleed" the steam accumulated in the hot leg through the vents. Depending upon the size of the vents, system pressure, and the adequacy of the instrumentation available to the operator, the flow through the vents could in fact be two-phase or liquid, thus raising the potential for a net loss of reactor coolant system inventory. For example, there is now no method of measuring the water level in the candy cane. Thus, the operator would not know whether steam or water was being discharged. In addition, an attempt to eliminate a steam bubble in the candy cane when the primary system conditions do not provide an adequate margin to saturation could be an exercise in futility. Under these circumstances, opening of the vents to relieve steam

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\*/ Note that the early version of Licensee Exhibit 1 at 2.1-31 (Am.21) stated: "Power-operated vents will be provided for the reactor coolant system in order to ensure that natural circulation and adequate core cooling can be maintained following an accident." (emphasis added) This language was changed in Amendment 23 by deleting "ensure that" and replacing it with "enhance". No promise is now made that the vents will "ensure" natural circulation.

might only result in causing more water to flash to steam. (Opening the vents lowers the pressure; if there is inadequate margin to saturation, more water would flash to steam.)

Finally, even if all of above questions could be resolved, there still remains a very significant question respecting the adequacy of the operator training and emergency procedures to detect the need for use of the vents and to guide their subsequent operation. It should be apparent from the foregoing that this is far from a simple matter. In fact, Item II.B.1 of NUREG-0737 required the development of procedures and supporting analysis for operator use of the vents, including assessment of the information available to the operator for initiating or terminating vent usage. There is no evidence on the record to indicate that such procedures and analysis have been developed for TMI-1. On the contrary, with respect to the evidence on the record, it is clear that the emergency procedures do not address use of the high point vents.

#### Conclusion

In sum, it is UCS's strong view that restart cannot be authorized on the basis of the current record, even if the Appeal Board's suggested changes are adopted. There is, quite simply, insufficient evidence in the record to support a conclusion that use of the hot leg high point vents can be relied upon to restore liquid natural circulation. In addition, the record shows that the use of a dedicated operator to control EFW flow will not make EFW adequately reliable.

There are many potential ways in which an adequately reliable means of decay heat removal might be provided at TMI-1. As suggested by the Semiscale test reports, plant specific analyses and tests could conceivably support the viability of feed and bleed. Use of the reliability analyses performed by the Staff for the EFW system could pinpoint areas where further modifications to

that system would improve its reliability, thus potentially eliminating the need for a back-up means of decay heat removal such as feed and bleed. Other techniques, such as auxiliary spray from the makeup system directly into the high point of the hot legs, could directly condense the steam bubbles thereby avoiding the problems associated with use of the high point vents to "bleed" the steam out of the system. One should also consider methods to enhance the reliability of the reactor coolant pumps so that they could be used to force circulation, condensing the steam bubbles.

The record must be reopened in order to determine what steps are required to assure adequate decay heat removal for TMI-1.

Respectfully submitted,

  
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Dated: November 22, 1982

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CERTIFICATE OF SERVICE

I hereby certify that copies of "UNION OF CONCERNED SCIENTISTS' RESPONSE TO APPEAL BOARD MEMORANDUM AND ORDER OF NOVEMBER 5, 1982" have been served on the following persons by deposit in the United States mail, first class postage prepaid, this 22nd day of November 1982.

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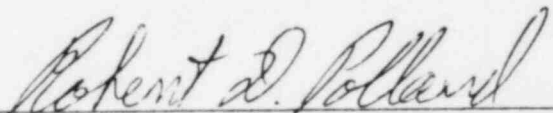
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