

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of

METROPOLITAN EDISON COMPANY,
JERSEY CENTRAL POWER & LIGHT
COMPANY, AND
PENNSYLVANIA ELECTRIC COMPANY

(Three Mile Island Nuclear Station
Unit No. 1)

DOCKET NO. 50-289

EXEMPTION

I.

Metropolitan Edison Company, Jersey Central Power and Light Company, and the Pennsylvania Electric Company (the licensees), are the holders of Facility Operating License No. DPR-50 which authorizes the operation of the nuclear power reactor known as Three Mile Island Nuclear Station, Unit No. 1 (TMI-1 or the facility), at steady reactor power levels not in excess of 2535 megawatts thermal (rated power). The facility consists of a Babcock & Wilcox Company (B&W) designed pressurized water reactor (PWR) located at the licensees' site in Dauphin County, Pennsylvania.

II.

In accordance with the requirements of the Commission's Emergency Core Cooling System (ECCS) Acceptance Criteria, 10 CFR 50.46, Metropolitan Edison Company (Met Ed) submitted on July 9, 1975, as supplemented

August 8, 1975, an ECCS evaluation for the facility. The ECCS performance submitted by Met Ed was based upon an ECCS Evaluation Model developed by the B&W, the designer of the Nuclear Steam Supply System for this facility. The B&W ECCS Evaluation Model had been previously found to conform to the requirements of the Commission's ECCS Acceptance Criteria, 10 CFR Part 50.46, and Appendix K. The evaluation indicated that with the limits set forth in the facility's Technical Specifications, the ECCS cooling performance for the facility would conform with the criteria contained in 10 CFR 50.46(b) which govern calculated peak clad temperature, maximum cladding oxidation, maximum hydrogen generation, coolable geometry and long-term cooling.

On April 12, 1978, B&W informed the NRC that it had determined that in the event of a small break Loss of Coolant Accident (LOCA) on the discharge side of a reactor coolant pump, high pressure injection (HPI) flow to the core could be reduced somewhat. Subsequent calculations indicated that in such a case the calculated peak clad temperature might exceed 2200F.

Previous small break analyses for B&W 177 fuel assembly (FA) lowered loop plants had identified the limiting small break to be in the suction line of the reactor coolant pump. Recent analyses have shown that the discharge line break is more limiting than the suction line break.

TMI-1 has an ECCS configuration which consists of two high pressure injection (HPI) trains. Each train has a HPI pump and the train injects into two of the four reactor coolant system (RCS) cold legs on the discharge side of the RCS pump. (There is also a third HPI pump installed.) The two parallel HPI trains are connected but are kept isolated by manual valves (known as the cross-over valves) that are normally closed. Upon receiving a safety injection signal the HPI pumps are started and valves in the four injection lines are opened. Assuming loss of offsite power and the worst single failure (failure of diesel to start) only one HPI pump would be available and two of the four injection valves would fail to open.

If a small break is postulated to occur in the RCS piping between the RCS pump discharge and the reactor vessel, the high pressure injection flow injected into this line (about half of the output of one high pressure pump) could flow out the break. Therefore, for the worst combination of break location and single failure, only one-half of the flow rate of a single high pressure ECCS pump would contribute to maintaining the coolant inventory in the reactor vessel. This situation had not been previously analyzed and B&W had indicated that the limits specified in 10 CFR 50.46 may be exceeded.

B&W has stated that they have analyzed a spectrum of small breaks in the pump discharge line and have determined that to meet the limits of 10 CFR 50.46, operator action is required to open the two manual operated crossover valves and to manually open the two motor driven isolation valves which had failed to open and align all four isolation

valves. This would allow the flow from the one HPI pump to feed all four reactor coolant legs. B&W has assumed that 30% of the flow would be lost through the break and 70% would refill the core.

B&W has prepared a summary entitled "Analysis of Small Breaks in the Reactor Coolant Pump Discharge Piping for the B&W Lowered Loop 177 FA Plants", April 24, 1978 (the B&W Summary), which describes the methods used and the results obtained in the above analysis. The analysis models operator action by assuming a step increase in flow to the reactor vessel (with balanced flow in the three intact loops) ten minutes after the LOCA reactor protection system trip signal occurs.

By letter dated April 27, 1978, Met Ed submitted a copy of the B&W Summary for our review. In their submittal Met Ed stated that they had reviewed the B&W Summary and determined that the results were applicable to TMI-1 and that operation of TMI-1 at 100% of full power (2535 Mwt) would be in full conformance with 10 CFR 50.46. Recognizing, however, that there was insufficient time available to the NRC staff to fully review the B&W Summary and make a similar determination prior to the scheduled startup of TMI-1 in Cycle 4 (estimated startup date of April 27, 1978), Met Ed requested an exemption from 10 CFR 50.46, until such time as the NRC staff had completed their review. The

requested exemption would authorize startup and power operation of TMI-1 up to 100% of full power (2535 Mwt).

In their submittal of April 27, 1978, Met Ed also stated that they had modified certain plant procedures to provide the necessary operator actions on a time scale consistent with that assumed in the analysis, and that they had conducted a drill to verify that the assumed operator response time was achievable. Met Ed also committed to submit as soon as possible a request for amendment of the TMI-1 Technical Specifications as appropriate to reflect adoption of these procedures, and committed to submit a proposal for a permanent solution to this problem by July 24, 1978.

We have completed a preliminary review of the B&W Summary. In the Summary, B&W states that a .15 ft.² discharge line break, with operator actions consistent with that modeled in the analysis, is the most limiting case. To arrive at this conclusion, B&W has performed analyses at break sizes of .3, .2, .15, .1, and .04 ft.². The results, which were obtained using an approved Appendix K model for blowdown, indicate core uncover for about 500 seconds for the 0.15 ft.² break. For this break size B&W has conservatively calculated the peak clad temperature to be approximately 1760 F; well below the limits of 10 CFR 50.46(b).

Based on review of the B&W Summary, however, we find that the calculations do not clearly support the conclusion that a .15 ft.² discharge line break is the most limiting case. In addition, the Summary does not demonstrate that the assumptions employed in supplying heat inputs to the FOAM portion of the calculations were conservative. We are also reviewing whether use of simplified input in the FOAM calculations satisfies the requirement for calculation using an approved model. Accordingly, we cannot conclude at this time that operation of TMI-1 at 100% of licensed power would be fully in conformance with 10 CFR 50.46. On the other hand, for operation of this facility at power levels up to 91% of full power (2311 Mwt), ECCS performance calculations for the limiting small break indicate that this break does not result in core uncovering, if appropriate operator action is properly taken (as described above), thus providing a very substantial margin on peak clad temperature below the limits of 10 CFR 50.46(b).

Therefore, until we have had the opportunity to fully assess the B&W calculations, supplemented as required, the staff cannot determine that operation of TMI-1 at full power under the conditions of the revised calculations by B&W applicable to this facility conforms fully to the requirements of 10 CFR 50.46. However, operation of TMI-1 at power levels of up to 2311 Mwt and in accordance with appropriate operating procedures, will assure that the ECCS system will conform to the performance criteria of 50.46. Accordingly, while B&W calculations applicable to this facility are completed to achieve full compliance with 10 CFR 50.46, operation of the facility at power levels up to 2311 Mwt with appropriate operating procedures will not endanger life or property or the common defense and security.

In the absence of any safety problem associated with operation of the facility during the period until the B&W calculations, as supplemented, are completed, there appears to be no public interest consideration favoring undue restriction of the operation of the captioned facility. Accordingly, the Commission has determined that an exemption in accordance with 10 CFR 50.12 is appropriate. The specific exemption is limited to the period of time necessary to complete computer calculations.

III.

Copies of the following documents are available for inspection at the Commission's Public Document Room at 1717 H Street, Washington, D.C. 20555, and are being placed in the Commission's local public document room at the State Library of Pennsylvania, Harrisburg, Pennsylvania.

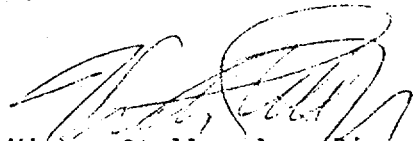
- (1) the application for exemption dated April 27, 1978, and
- (2) this Exemption in the matter of Metropolitan Edison Company, Jersey Central Power and Light Company, and Pennsylvania Electric Company, Three Mile Island Nuclear Station, Unit No. 1

IV.

WHEREFORE, in accordance with the Commission's regulations as set forth in 10 CFR Part 50, the licensees are hereby granted an exemption from the requirements of 10 CFR 50.46(a) that ECCS performance be calculated in accordance with an acceptable calculational model which conforms to the provisions in Appendix K. This exemption is conditioned as follows:

- (1) Metropolitan Edison Company shall submit supplementary analyses of ECCS cooling performance calculated in accordance with the B&W Evaluation Model, as requested by the Commission, as soon as possible.
- (2) Until further authorization by the Commission, the power level shall not exceed 2311 Mwt, and
- (3) Until further authorization by the Commission, Metropolitan Edison Company shall operate the facility in accordance with the procedures described in its letter of April 27, 1978.

FOR THE NUCLEAR REGULATORY COMMISSION



Victor Stello, Jr., Director
Division of Operating Reactors
Office of Nuclear Reactor Regulation

Dated at Bethesda, Maryland,
this 27th day of April 1978.