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MEMORANDUM FOR: D. B. Vassallo, Assistant Director for Light Water Reactors, DPM

FROM: D. F. Ross, Assistant Director for Reactor Safety, DSS

SUBJECT: SER SUPPLEMENT FOR THREE MILE ISLAND, UNIT 2

Plant Name:	Three Mile Island, Unit 2
Docket Number:	50-320
Milestone Number:	27-24
Responsible Branch	LWR-4
and Project Manager:	H. Silver
Systems Safety Branch Involved:	Core Performance Branch
Description of Review:	SER Supplement
Requested Completion Date:	NA
Review Status:	Complete

The Physics Section of The Core Performance Branch has prepared the enclosed supplement to the Safety Evaluation Report for Three-Mile Island, Unit 2.

Original signed by
D. F. Ross

Denwood F. Ross, Assistant Director
for Reactor Safety
Division of Systems Safety

Enclosure:
As Stated

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SER Supplement - THI-2

The Committee indicated in its letter of October 22, 1976 that it believes that the proposed power distribution monitoring methods may be acceptable but that an augmented startup program should be employed, and that satisfactory experience at 100% steady state power and during transients at less than full power should be obtained. Further, this experience should be reviewed and evaluated by the NRC Staff prior to operating at full power in the load following mode.

In our view an augmented startup program is not necessary. Such a program (1,2,3) was conducted at the Rancho-Seco Nuclear Generating Station Unit 1 reactor which has a core identical to that of TMI-2. Rancho-Seco Unit 1 was operated at 2568 Mwt (~92% rated power) for an extended period in order to proof test the bleed and fuel mode of operation prior to operation at full power. A conscious effort was made to exercise the bleed and feed system. Up-ramp and down-ramp power changes were performed in the turbine-following, reactor-following and integrated modes of the integrated control system.

A "pseudo-design power transient" was performed in which a rapid reduction in power by 50% FP was performed, power was held at the low value (~30% FP) until the xenon buildup was maximum, and the power was quickly raised to its original value. In addition to this pseudo-design transient several actual load following transients were performed in response to dispatcher commands. This situation came about due to run-off conditions in the spring of 1975 that dictated the use of hydro-electric

plants as base loads for the power grids.

The results of the bleed and feed operations were evaluated with respect to the accuracy with which they could be performed. Over 50 transients were performed, some with boron alone and others with combination of boron and control rod movement. The end point boron concentration was checked against the target value and the deviation in the results was within the measurement uncertainty in the boron concentration.

Power distribution measurements were performed upon return to full power after the pseudo-design transient and showed that thermal margins were met when extrapolated to 102% FP. The ability of the axial imbalance and rod position monitoring to limit power peaking was demonstrated in the tests which were used to calibrate the axial imbalance instrumentation. These tests showed margins to DNBR and Fuel Melt limits when extrapolated to design overpower conditions.

Upon completion of this program the licensee requested permission to increase power to 2772 Mwt (the design rated power). This request was reviewed by the staff and the ACRS [4] and approval to proceed to 100% FP was granted. While the request was being reviewed, a broken turbine blade necessitated the shutdown of the reactor. In December, 1975 the reactor was again started up and the rest of the startup tests (those at >92.6% FP) were conducted. Full power was achieved in March 1976 and operation at full power continued into April. At this time insulation failure in the station generator necessitated shutdown of the reactor.

Repairs were completed and full power was again reached in October, 1976.

The ability to calculate power distributions - particularly during transients - is being pursued with B&W on a generic basis. A topical report on the nuclear uncertainty factor is in the final stages of preparation at B&W and reports on the methods used to establish operating limits and protection system set points are being prepared. The additional data that might be generated from an augmented startup program in TMI-2 would have no appreciable effect on these efforts.

In view of the circumstances described above we conclude that an augmented startup program in TMI-2 is not necessary.

References

1. Rancho-Seco Unit 1 Startup Report
March, 1975 (Docket 50-312)

2. Ranch Seco Unit 1 Performance Report
March, 1975 (Docket 50-312)

3. Letter, Mattimoe to Engelken, dated July 30, 1976

4. Letter, W. Kerr to W. A. Anders, dated July 16, 1975,
on proceedings of the 183rd meeting of the ACRS, July 10 - 12, 1975