



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO CONFORMANCE WITH LICENSE CONDITION 2.C.(5)

SUPPRESSION POOL TEMPERATURE MEASUREMENTS

DETROIT EDISON COMPANY

FERMI-2

DOCKET NO. 50-341

1.0 INTRODUCTION

With the issuance of the Fermi-2 operating license, License Condition 2.C.(5) was imposed. This license condition stated that "DECo shall accomplish during the first fuel cycle, all the tasks described in its letter dated March 6, 1985, regarding the series of SRV tests which will confirm its methodology for measuring the suppression pool bulk temperature." The tasks required in the March 6, 1985 letter committed the license to:

"Prior to operation at full power, a test shall be performed involving a safety/relief valve (SRV) actuation to accomplish the following:

1. Measuring the pool temperature in all eight sectors of the suppression pool at approximately 5 minute intervals.
2. Demonstrate that all adjacent temperature readings are within 45°F of each other throughout SRV actuation with suppression pool mixing due to operation of a reactor heat removal system pump.
3. Reperform an SRV actuation without suppression pool mixing or cooling and record the test data in the manner described above. (Technical Specification maximum temperature limitations will not be exceeded.) Measure temperatures in all eight sectors of the suppression pool for 48 hours or until thermal equilibrium of the pool is reached. Demonstrate that using the seven sector method, excluding the highest sector suppression pool temperature reading, will yield a conservative value for the bulk temperature of the suppression pool within a 48-hour period.

During the first year of normal operation under Operational Conditions 1 and 2, the following information shall be recorded:

4. The suppression pool temperature in all eight sectors every 24 hours.

5. The conditions in the suppression pool which at the time promoted mixing, if applicable (e.g., cooling of the suppression pool or actuation of an SRV).

The data recorded above shall be submitted to the NRC before startup following the first refueling outage. In the event the 45°F temperature differential is exceeded, such an occurrence shall be reported per 10 CFR 50.73."

The purpose of these tasks was to confirm the methodology used by the licensee for measuring the suppression pool bulk temperature. The licensee forwarded the results of these tasks to the staff in a October 20, 1989 submittal. Additional information was submitted by the licensee in an April 3, 1990 submittal.

Detroit Edison's local suppression pool temperature model used during SRV transients was reviewed in Section 3.8.1.1 of NUREG-0798, Supplement No. 5, "Safety Evaluation Report Related to the Operation of Enrico Fermi Atomic Power Plant, Unit No. 2", dated March 1985. This review states that "The applicant's analyses were developed by using a comprehensive computational methodology developed by GE. A key element of this overall methodology is a computer code known as TPOOL which computes the local suppression pool temperature as function of the performances of the nuclear steam supply system, the SRV and the reactor heat removal system." In a meeting with General Electric and the Mark I Owner's Group on August 25, 1983, the staff accepted the use of TPOOL for calculating the local to bulk suppression pool temperature differences based on several reasons. One reason for the acceptance of this model was that the 43°F/15°F (temperature difference without and with RHR operating) NRC criteria is only exceeded when the reactor pressure is at 150 psia or less.

2.0 EVALUATION

Detroit Edison performed two tests of SRV actuation - one with suppression pool mixing and the other without suppression pool mixing.

The test of SRV actuation with suppression pool mixing was evaluated by the staff to confirm that the differential temperature between thermocouples did not exceed 15°F, which is consistent with the analysis in TPOOL. This test was performed by opening each SRV for a period of approximately 30 seconds and measuring the temperature in the suppression pool in 5 minute intervals. The results of this test indicate that the maximum temperature differential between adjacent sectors was 9°F and that the bounding temperature differential of 15°F between sectors was not approached.

The test of SRV actuation without suppression pool mixing was to demonstrate that, by using the seven sector method which excludes the highest sector suppression pool temperature reading, a conservative value for the bulk pool temperature would result. The seven sector method is used by Detroit Edison in Technical Specification 3.6.2.1 to allow continued operation with one

suppression pool water temperature instrumentation channel inoperable. The test of the seven sector method assumes that the highest temperature thermocouple reading is inoperable and that this temperature measurement can be conservatively estimated by adding 45°F to the highest temperature reading of the seven remaining operable thermocouples. This calculated value is used as the temperature for the inoperable thermocouple. Therefore, in order for this seven sector method to be conservative, the temperature differential between the highest two thermocouples readings must not exceed 45°F.

This test of SRV actuation without suppression pool mixing was performed by opening one SRV for 3 minutes 33 seconds and measuring the temperature in all eight sectors of the suppression pool in 5 minute intervals. The results of this test indicate that the highest temperature differential was 15°F and that it occurred at time 0652 between adjacent sectors 3 and 4. However, since the exact time of SRV opening and closing was not included and the time span between the recorded temperature measurements (5 minutes) was greater than the time span of the entire SRV actuation (3 minutes 33 seconds), the staff was unable to determine whether the seven sector method was conservative nor whether the differential temperature between the two highest thermocouples had exceeded 45°F.

Detroit Edison subsequently provided the staff with the results of this test in an April 3, 1990 submittal where the temperature measurements were recorded in 1 minute intervals. These results indicate that the highest temperature differential was 21°F and that throughout the 3 minute 33 second SRV actuation the highest temperature differential stabilized at approximately 20°F. Therefore, the staff concluded that the maximum temperature differential had occurred for any time duration of SRV actuation. Using these temperature measurements, the staff was able to confirm that the methodology behind the seven sector method is conservative and that the differential temperature between the highest two thermocouples did not exceed 45°F.

In order to determine whether any long term thermal gradients are established in the suppression pool, Detroit Edison submitted the daily temperature measurements of all eight sectors of the suppression pool from January 1988 through June 1989. A review of these measurements indicates that the maximum temperature differential around the suppression pool is 7°F, however the average maximum temperature differential is approximately 3°F. Additionally, these measurements do not account for instrumentation error. The staff therefore concludes that no significant thermal gradients exist in the suppression pool.

In addition, Detroit Edison provided the results of the loss of off-site power test and MSIV closure test. These results were also within the 45°F criteria of the suppression pool differential temperature. This additional data further confirms the methodology used by Detroit Edison for measuring the suppression pool temperature.

3.0 CONCLUSION

The staff performed a technical review relevant to meeting the objectives of the subject License Condition. Based on the above evaluation, the staff finds that Detroit Edison has satisfied each of the technical objectives and has satisfied License Condition 2.C.(5) in doing so.

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