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September 4, 1981
L1L 254

Office of Nuclear Reactor Regulation
Attn: J. F. Stolz, Chief
Division of Licensing
Operating Reactors Branch # 4
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Sir:

Three Mile Island Nuclear Station, Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
PORV Opening Probability (II.K.3.7)

Enclosed please find responses to questions 1 and 2 concerning the subject item. Responses to the questions concerning Report of PORV Failures (II.K.3.2) will be provided in the near future.

Sincerely,

RJ Toole for
H. D. Hukill
Director, TMI-1

HDH:LWH:vjf

Enclosure

A046 S1/1

QUESTION 1

The licensee is to show how he derived pressure rollover data, which is the primary system pressure rise above the high pressure reactor trip setpoint, as listed in Table 2.1-1 of the licensee's report.

RESPONSE

The RCS pressure rollover was determined as follows. Loss of feedwater transient data from the operating plants were reviewed. For those sets of data in which RCS pressure plots were available, the peak RCS pressure was read. Only the loss of feedwater events prior to March 1979 were considered. For all of these events the Reactor Protection System high pressure reactor trip setpoints were 2355 psig. The difference between the peak system pressure and 2355 was calculated. This simple difference represents the pressure overshoot for each of these particular events. No normalization or adjustment of the data was made to account for the difference in power levels or any other plant condition.

Twenty-six different loss of feedwater events were included in determining the rollover distribution. Because there is a tendency for site personnel to adjust reactor trip setpoints in a conservative fashion no data point was thrown out, even in those cases where the rollover was a negative number, i.e., the reactor trip occurred before the design trip setpoint was actually reached. This was done to provide a realistic estimate of the true expected rollover distribution.

QUESTION 2

The licensee is to show how he obtained the means and the standard deviations for the three normal distributions used in the Monte-Carlo analysis to

simulate the opening of PORV during an overpressure transient as discussed in 2.1.1 PORV Opening Probability based upon analyses in the license's report.

RESPONSE

The actual setpoints for PORV actuation and high RC trip are assumed to be a normally distributed random variable with means of 2450 and 2300 respectfully. The standard deviation of the setpoints were calculated from instrument accuracy values provided by the manufacturer. The small standard deviation (1.4 psi) is due to common modules in the PORV actuation and RPS high pressure trip channels. Both signals are processed through the same modules with the exception of one amplifier and one bistable in each path which are not common to both signal paths. The errors in the common signal paths cancel out leaving only the error in the two non common modules for each setpoint. It is assumed that the errors remain constant over the entire pressure range. Both modules have an accuracy of .1% and the pressure range (narrow range) of interest is approximately 1000 psi. The standard deviation is derived as $\sqrt{.001 \times 1000 + .001 \times 1000} = \sqrt{1 \text{ psi} + 1 \text{ psi}} = 1.4$ psi. It should be noted that the standard deviation of the overall calculations $\sqrt{(1.4)^2 + (1.4)^2 + (27.52)^2}$ is dominated by the 3rd term which is associated with the rollover data.

The mean of the rollover data has been calcuated to be 9.2 psi with a standard deviation of 27.5 psi. The supporting calculations and W test* follow. The data given in Table 2.1-1 is also plotted in the attached figure. The parameters of the data were calculated with the W value of .97756 supporting the assumption of normality.

* ANSI N15. 15-1974 Assessment of the Assumption of Normality

$$S^2 = \sum_{i=1}^{26} (X_i - \bar{x})^2 = 18934.62$$

$k=13$

$$b = \sum_{i=1}^{k} A_{n-i+1}(X_{n=i+1} - X_i) = 136.05$$

$$W = \frac{b^2}{S^2} = .97756$$

Coefficients used in the W test for normality with sample size 26.

A_{n-i+1}
.4407
.3043
.2533
.2151
.1836
.1563
.1316
.1089
.0876
.0672
.0476
.0284
.0094

ROLLOVER DATA