NSP

NORTHERN STATES POWER COMPANY

MINNEAPOLIS, MINNESOTA 55401

March 16, 1976

Mr. Victor Stello, Director
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Stello

MONTICELLO NUCLEAR GENERATING PLANT
Docket No. 50-263 License No. DPR-22

Additional Information Concerning November, 1975
Primary Containment Integrated Leakage Rate Test

Attached you will find 40 copies of "Supplement No. 1 to Report of Reactor Containment Building Integrated Leak Test-November, 1975". This report is submitted in response to a request from the Region III Office of Inspection and Enforcement.

This supplemental report contains an "Instrumentation Error Analysis" for the instrumentation used in the 1975 testing program.

Yours very truly,

L. O. Mayer

L. O. Mayer, PE
Manager, Nuclear Support Services

LOM/DMM/deb

cc: J. G. Keppler
G. Charnoff
MPCA
Attn: J. W. Ferman

Attachment

2705

NORTHERN STATES POWER COMPANY

MONTICELLO NUCLEAR GENERATING PLANT

Docket No. 50-263 License No. DPR-22

Supplement No. 1 to Report of Containment Building Integrated Leak Test November 1975

Date: March 16, 1976

1. Background

The original test report contained a calculation of the 95% confidence interval associated with the leakage rate measurement using a standard T-distribution error analysis. Since 10 CFR 50, Appendix J states that test reports shall include an "instrumentation error analysis", we have been requested to supply an error analysis based on certified instrument accuracies.

An instrumentation error analysis was included in test reports submitted in 1970, 1973, and 1974. The analysis was repeated in the 1974 and 1975 reports because the instrumentation was significantly upgraded from previous tests. The instrumentation used in the 1975 test program was identical to the instrumentation used in 1974 testing. An instrument error analysis using the 1975 test parameters is repeated and the results are seen to be essentially identical to those reported in 1974.

In the future our test reports will reference the instrumentation error analysis performed earlier unless changes in the test instrumentation require a revised analysis. The standard statistical T-distribution error calculation is a more rigorous determination of probable testing error and will continue to be made and reported following each test.

2. Instrumentation Error Analysis

The assumptions for the type A test error analysis and the derivation of the type A test error relation may be found in the summary technical report entitled REACTOR CONTAINMENT BUILDING INTEGRATED LEAK TEST, May 1973. The estimated variance for each type A test measurement are as given below:

a) Estimate of $\sigma^2(T)$

All temperature measurements were obtained with ALPHA-LINE RTD transmitters connected to the plant process computer. This system has an accuracy over the range of 60°F to 170°F of at least 0.10°F. Therefore:

$$\sigma^2(t_i) = \frac{(0.10)^2}{2} = 2.5 \times 10^{-3}\ {}^{\circ}R^2$$

Applying the weighting factors used in the test:

$$T = \sum_{i=1}^{i=20} w_i t_i$$

$$\sigma^2(T) = \sum_{i=1}^{i=20} w_i^2\, \sigma^2(T_i) = (6.7 \times 10^{-2})(2.5 \times 10^{-3}) = 1.67 \times 10^{-4}\ {}^{\circ}R^2$$

b) Estimate of σ^2 (P)

The Wallace Tiernan gauge used to measure the containment pressure is readable to 0.012 PSIG and has a certified accuracy of 0.04 PSIG. The barometric pressure instrument is readable to 0.01 INCHES and has an equivalent accuracy when corrected for temperature effects on the density of mercury and on scale distortion. The combined error is given by:

$$\sigma^2 (P) = \left(\frac{0.012}{2}\right)^2 + \left(\frac{0.04}{2}\right)^2 + \left(\frac{0.01 \quad .491}{2}\right)^2 + \left(\frac{0.01 \quad .491}{2}\right)^2$$

$$= 4.486 \times 10^{-5} \text{ psi}^2$$

$$= 0.3440 \text{ in } H_2O^2$$

c) Estimate of $\sigma^2(\Delta P)$

The water filled manometer is readable to within 0.02 inche· ·ater. Considering that left and right legs of the manometer had t(oe read gives:

$$\sigma^2 (\Delta P) = \sigma^2 (L_{LL}) + \sigma^2 (L_{RL})$$

$$= 2 (0.02/2)^2 = 2 \times 10^{-4} \text{ (inches water)}^2$$

d) Estimate of σ^2 (P_V)

All vapor pressure measurements were obtained with Foxboro type 2701 RPG DEWCELS connected through resistance-current converters and special RTD processing boards to the plant computer. The DEWCELS are certified to an accuracy of at least 0. 1% and the resulting system error will not exceed 0.2 - INCHES WATER vapor pressure. Therefore:

$$Pv = \sum_{i=1}^{i=6} w_{vi} P_{vi}$$

$$\sigma^2 (P_v) = \sum_{i=1}^{i=6} w_{vi}^2 \sigma^2 (P_{vi})$$

$$= \sum_{i=1}^{i=6} w_{vi}^2 \left(\frac{0.2}{2}\right)^2$$

Using the appropriate weighting factors:

$$\sigma^2 (P_v) = 1.86 \times 10^{-3} \text{ INCH } H_2O^2$$

e) The overall measurement error is determined using the individual measurement variances and the following parameters obtained from the test data:

$\bar{L}_5$ = 0.2456 wt %/day

P_o = 1564.34 inches water

$\bar{P}_v$ = 6.41 inches water

$\overline{\Delta P}_2$ = 4.15 inches water

$\bar{T}$ = 537.48 ^{o}R

$$\sigma^2(L) = 2\,\sigma^2(T)\left[\frac{100}{P_o T}(\overline{\Delta P}_v + \bar{P}_v)^2\right] + \sigma^2(P)\,(\bar{L}_5/P_o)^2 + 2\,\sigma^2(\Delta P)\,(100/P_o)^2 + 2\,\sigma^2(P_v)\,(100/P_o)^2$$

$$= 1.684 \times 10^{-5}$$

The 95% confidence interval for a single 24-hour data comparison becomes:

$$L \pm 2\sigma(L) = L \pm 0.0082 \text{ wt\%/day}$$

And the 95% confidence interval for the average of 5 24-hour data comparisons becomes:

$$\bar{L}_5 \pm \frac{2\,\sigma(L)}{\sqrt{5}} = 0.2456 \pm 0.0037 \text{ wt\%/day}$$

3. Comparison of Methods of Error Calculation

METHOD	95% CONFIDENCE INTERVALS	
	1974 TEST	1975 TEST
Instrumentation Error Analysis	0.2520 ± 0.0033	0.2456 ± 0.0037
T-Distribution Error Calculation	0.2520 ± 0.0105	0.2456 ± 0.0087

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ENCLOSURE
Supplement # 1 to Report of Containment Building Integrated Leak Test.....

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