



VERMONT YANKEE NUCLEAR POWER CORPORATION

SEVENTY SEVEN GROVE STREET
RUTLAND, VERMONT 05701

2.C.2.1
FVY 82-69

REPLY TO:
ENGINEERING OFFICE
1671 WORCESTER ROAD
FRAMINGHAM, MASSACHUSETTS 01701
TELEPHONE 617-872-8100

June 15, 1982

United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Office of Nuclear Reactor Regulation
Mr. Domenic B. Vassallo, Chief
Operating Reactors Branch #2
Division of Licensing

References: (a) License No. DPR-28 (Docket No. 50-271)
(b) Letter, USNRC to VYNPC, dated May 14, 1982

Subject: NUREG-0737, Items II.F.1.4, II.F.1.5, and II.F.1.6

Dear Sir:

Reference (b) requested Vermont Yankee to review and confirm our responses to questions related to NUREG-0737, Items II.F.1.4, "Containment Pressure Monitor," II.F.1.5, "Containment Water Level Monitor," and II.F.1.6, "Containment Hydrogen Monitor." These questions were originally addressed in a telecon on March 26, 1982. The requested confirmation and additional clarification is provided as an attachment to this letter.

We trust that this information is satisfactory; however, should you have any questions, please do not hesitate to contact us.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

J. B. Sinclair
J. B. Sinclair
Licensing Engineer

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JBS:dad

Attachments

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ENCLOSURE 1

Question 1: The review we are discussing is the Containment Systems Branch (CSB) part of the total review discussed in NUREG-0737. The CSB review consists of all items discussed under "Position" and "Clarification" except the review of compliance to the Appendix B criteria, and the review of the measurement system completion dates.* *In the submittals we received to date, you have not indicated that you plan to take exception to any of the NUREG-0737 criteria in our area of review. Are you planning any exceptions in our area of review of which we are not aware?

Answer 1: No.

Question 2: What is the accuracy of your pressure monitor? State this for both the indicator and the recorder.

Answer 2: The pressure monitor has readouts on both an indicator and recorder.

Transmitter	SD = 0.25%
Indicator	SD = 1.5%
Recorder	SD = 0.5%
Indicator System	SD = RSS (0.25%, 1.5%) = 1.52%
Recorder System	SD = RSS (0.25%, 0.5%) = 0.56%

where SD is the standard deviation of errors and RSS is the root sum square.

Vermont Yankee Clarification:

1. The transmitter installed to measure drywell pressure is a Rosemount Model 1153B. The manufacturer states in his product description that the accuracy for zero-based spans at reference conditions is +0.25% of calibrated span, including

the combined effects of linearity, hysteresis and repeatability. The manufacturer has stated verbally that this represents a 100% confidence level.

2. The indicator installed is a Sigma Model W-1251. The manufacturer states in his product description that the accuracy of this indicator is +1.5% of full-scale value. Further, the repeatability is +2% of full-scale value. The manufacturer has stated verbally that this accuracy represents 100% confidence factor. From our understanding of the terms accuracy and repeatability, it appears that use of the repeatability value would be more appropriate in this case since the accuracy is a matter of periodic calibration and the repeatability will govern the variation between successive readings. Note also that use of repeatability in this case is more conservative.
3. The recorder installed is a Leeds and Northrup Speedomax M Mark III. The manufacturer states in his operator's manual that the accuracy of this recorder is +0.5% of full-scale value. The manufacturer has stated verbally that this represents a 100% confidence level, and includes repeatability.
4. We concur that the use of the root sum square method is appropriate to calculate the loop accuracy for both the indicator loop and the recorder loop.

Based upon the accuracies given above, we calculate these loop accuracies as follows:

$$\begin{aligned} \text{Indicator } (3SD)^2 &= (0.25\%)^2 + (2.0\%)^2 \\ &= 4.06 \\ 3SD &= 2.02\% \end{aligned}$$

$$\begin{aligned} \text{Recorder } (3SD)^2 &= (0.25\%)^2 + (0.5\%)^2 \\ &= 0.31 \\ 3SD &= 0.56\% \end{aligned}$$

Question 3: What is the time response of your pressure monitor? State this for both the indicator and the recorder.

Answer 3: Transmitter TC = 0.2 sec.

Indicator Sweeps Full Scale in 2.5 sec. $TC = 2.5/4 = 0.63$ sec.

Recorder Sweeps Full Scale in 1 sec. 63% of scale in 0.63 sec.

Indicator System TC = TC (HP-67) = 0.9 sec.

Vermont Yankee Clarification:

1. The transmitter manufacturer states in his product description that the fixed response time (63%) at 100⁰F for these transmitters is 0.2 seconds.
2. The indicator manufacturer states in his product description that the response time is 2.5 seconds maximum. We understand this to mean 2.5 seconds to full scale (100%). This would give the equivalent time constant (63%) as $2.5/5 = 0.5$ seconds. It is our understanding that "for a step change, the output is defined as reaching its final value after five time constants".¹
3. The recorder manufacturer states in his operator's manual that the span-step time response time is less than one second, and that pen movement may generally be considered linear with respect to time.
4. The referenced letter states that the indicator system time constant is 0.9 seconds and that this was calculated by using an NRC developed calculator program. Since we have not seen this program, we are not able to comment on the result obtained.

Question 4: What is the accuracy of your water level monitor? State this for both the wide-range instrument and the narrow-range instrument.

Answer 4: Water level monitor is in torus only. Readout is on both indicator and recorder. Uncertainties are as follows:

Transmitter	SD = 0.25%
Indicator	SD = 1.5%
Recorder	SD = 0.5%
Indicator System	SD = RSS (0.25%, 1.5%) = 1.52%
Recorder System	SD = RSS (0.25%, 0.5%) = 0.56%

Vermont Yankee Clarification:

The torus water level monitors utilize the same types of equipment as the drywell pressure monitors. The clarifications stated previously under pressure monitors apply here also.

Question 5: Where are the hydrogen sample ports placed?

Answer 5: There are three sample ports in the drywell of the following locations: (1) top of drywell, (2) halfway up vessel in drywell, and (3) at bottom of vessel on drywell.

There is one sample port in the top quadrant of the torus available through two separate paths.

Question 6: Is there any obstruction which would prevent hydrogen, escaping from the core, from reaching the hydrogen sample ports quickly?

Answer 6: No.

Question 7: What is the accuracy of your hydrogen monitor?

Answer 7: The hydrogen analyzers have readouts on both an indicator and a recorder.

The analyzers come as a unit which consists of an analyzer unit, a linearizer, an amplifier and an indicator. These units have a SD = 2.5%.

The recorders being added have an SD = 0.5%. Assuming that the built-in indicator has an SD = 1.0%, we have Recorder System $SD^2 = 2.5\% - 1.0\%^2 + 0.5\%^2 = 5.50$.

Recorder System SD = 2.35

Vermont Yankee Clarification:

1. The hydrogen monitors being installed are Teledyne Analytical Instruments. The manufacturer states in his product description that the accuracy of these units is +2.5% of full scale (dry basis). The manufacturer has stated verbally that this represents a 100% confidence level, and that the effect of the indicator on this figure is negligible.
2. The recorder being used is the same type utilized in the pressure and level monitors, and therefore the same clarifications apply in this instance.
3. Based upon the accuracies given above, we calculate the recorder loop accuracy as:

$$\begin{aligned}(3SD)^2 &= (2.5\%)^2 + (0.5\%)^2 \\ &= 6.50 \\ 3SD &= 2.55\%\end{aligned}$$

Notes:

1. Curtis D. Johnson, Process Control Instrumentation Technology, John Wiley and Sons, 1977.