VERMONT YANKEE NUCLEAR POWER CORPORATION

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REPLY TO
ENGINEERING OFFICE
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July 12, 1991
BVY 91 - 65

United States Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

References:
a. License No. DPR-28 (Docket No. 50-271)
b. Letter, VYNPC to USNRC, BVY 91-02, dated January 15, 1991
c. Letter, USNRC to VYNPC, NVY 91-56, dated April 16, 1991
d. Letter, VYNPC to USNRC, BVY 91-53, dated May 16, 1991

Subject: Response to Second Request for Additional Information - Proposed Change No. 162, Toxic Gas Monitoring System

Dear Sir:

By Reference (b), Vermont Yankee submitted a proposed change to technical specifications regarding the Toxic Gas Monitoring System. As a result of review of this proposed change, NRC forwarded a request for additional information via Reference (c). Vermont Yankee responded to NRC's request for additional information via Reference (d).

On Wednesday, July 3, 1991, a telecon occurred between Vermont Yankee and NRC staff regarding further NRC questions on the proposed change submittal [Reference (b)]. NRC requested and Vermont Yankee agreed to formally submit responses to the additional questions raised during this telecon.

Enclosed please find Vermont Yankee's response to NRC's request for additional information that resulted from the July 3, 1991 telecon.

We trust that the enclosed information will satisfactorily resolve NRC's remaining questions regarding Vermont Yankee's submittal of Reference (b) and will lead to approval of this license amendment. Should you have any additional questions regarding this issue, please contact this office.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Leonard A. Tremblay, Jr.

Leonard A. Tremblay, Jr.
Senior Licensing Engineer

cc: USNRC Region I Administrator
USNRC Resident Inspector - VYNPS
USNRC Project Manager - VYNPS

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<u>ENCLOSURE</u>

CLARIFICATION TO TECHNICAL SPECIFICATION CHANGE SUBMITTAL
FOR TOXIC GAS MONITORING SYSTEM (TGMS)

VERMONT YANKEE NUCLEAR POWER CORPORATION
DOCKET NO. 50-271
TAC NO. 79442

References: (a) Letter, BVY 91-02, W. P. Murphy (VYNPS) to Document Control Desk (USNRC), "Proposed Change No. 162, Toxic Gas Monitoring System," dated January 15, 1991.

(b) Regulatory Guide 1.78, "Assumptions for Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," June, 1974.

(c) Standard Review Plan, Section 2.2.3, "Evaluation of Potential Accidents", NUREG-75/087, Rev.1.

Based on our telephone conversations with J. Wing (NRC, NRR) and M. Fairtile (NRC, Project Manager) on July 3, 1991, we are providing this clarification to our submittal of Reference (a). This clarification addresses the following three items:

1. The probability of a significant release (of chlorine), given a release (from a railroad accident), on page 19 of YAEC-1759 (enclosed with Reference (a)).

2. The time interval of 4 hours during which it is assumed that the operating crew is incapacitated (due to chlorine concentrations greater than the toxic limits in the control room), on page 21 of YAEC-1759.

3. Numerical uncertainties for input parameters used throughout Sections 6.3 and 6.4 of YAEC-1759.

<u>Item 1: Probability of a Significant Release</u>

As noted on page 19 of YAEC-1759, the value for this parameter was based on actual chlorine incident data from the U.S. Department of Transportation (Reference 17 of YAEC-1759). The NRC reviewer questioned whether the weight distribution of railroad cars for the actual incident data is representative of future expected shipments.

The approach used for this parameter is the same as the approach used for other data in YAEC-1759. That is, we used the most representative data available. Because the data are by definition a measurement of what has happened in the past, use of such data always involves the implicit assumption that past performance is a reasonable estimate of future performance. We believe that this assumption is valid if there are no reasons to suspect a change in the future. Based on telephone conversations with the railroad, we have no reason to believe that the weight distribution of chlorine shipped in individual railroad cars will change significantly in the future. There is neither the need nor track structure (rail/bridge load capacity, track curvature, size of sidings, etc.) to warrant an increase in chlorine tank car capacity.

Item 2: Four-Hour Time Interval

Page 21 of YAEC-1759 assumes that a postulated chlorine release will occur, on average, halfway through a typical operating crew shift of eight hours. It was also assumed that only the operating crew on shift at the time of the chlorine release will be incapacitated, and that other crews would be available later. Taken together, these two assumptions form the basis for the assumed four-hour interval during which there would be no crew available. The NRC reviewer questioned whether a relief crew would be able to respond, given the large concentration of chlorine shown in Table 6.2 of YAEC-1759.

The purpose of Table 6.2 was to show the maximum control room concentration, and the time interval between the time of detection and the time that the toxic limit (IDLH) is reached. Table 6.2 was not meant to imply that the maximum control room concentration would exist for long periods of time. Additional calculations (using the methodology of YAEC-1759) made in response to this issue show that the maximum control room concentration of chlorine is reached approximately ten minutes after the toxic limit (IDLH) is reached. This assumes no operator action to isolate the control room. Our calculations also show that the control room concentration then drops to below the toxic limit at about one and one half hours after the maximum concentration is reached. Thus, we believe that it is reasonable to assume that relief crews would be able to take appropriate actions within the assumed four-hour time window.

We note also that the probabilistic analysis for chlorine in Section 6.4 of YAEC-1759 took no credit for operator action to isolate the control room and to don self-contained breathing apparatus. This assumption was made because the time interval between the time of detection and the time that toxic limit is reached was calculated to be less than two minutes. Two minutes is the criteria specified in Regulatory Guide 1.78 (Reference (b)) for operator action to don self-contained breathing apparatus. Our calculations show that approximately one minute is available for operator action after detection (by smell) and before the toxic limit is reached. Although it is difficult to calculate, there is also some finite time interval between the time at which the toxic limit is reached and the time at which incapacitation will actually occur. Thus, it is possible that the operators will succeed in manually isolating the control room and donning self-contained breathing apparatus. In this case, the four-hour time interval would be reduced to zero hours.

Item 3: Numerical Uncertainties

The NRC reviewer requested numerical uncertainty estimates for the parameters used in the probabilistic analyses of YAEC-1759 (Sections 6.3 and 6.4). Section 6.5 of YAEC-1759, "Treatment of Uncertainties" provided a qualitative evaluation of uncertainties.

As stated in Section 6.5 of YAEC-1759, we believe that a qualitative treatment of uncertainties is sufficient for this analysis. The acceptance criteria for the probabilistic analysis presented in YAEC-1759 is Standard Review Plan (SRP) Section 2.2.3 (Reference (c)). The wording of SRP 2.2.3 includes such phrases as:

"...the expected rate of occurrence..."

"...reasonable qualitative arguments...".

Such language makes it clear that the intent of SRP 2.2.3 is to consider best-estimate ("expected") analyses and qualitative judgement.

The approach of YAEC-1759 was to calculate the probability of loss of control room habitability using the best available information. This was performed in Section 6.3 and the resulting point estimate frequency was about 4E-07 per year. This value, along with qualitative arguments regarding methodological conservatism, satisfies the SRP 2.2.3 criteria without the need for further calculations. However, use of this value alone can be very conservative because it assumes that loss of control room habitability leads directly to a 10CFR100 fission product release. The calculations in Section 6.4 of YAEC-1759 were performed as a means of estimating the magnitude of this conservatism.

Using best-estimate values, the probability of a 10CFR100 fission product release given control room uninhabitabilty (for a four-hour duration) was shown in Section 6.4 to be on the order of 1E-05. While there are uncertainties in calculating this value, the point estimate nevertheless shows that there is significant conservatism in assuming that control room uninhabitability leads directly to a 10CFR100 fission product release.

We note that the reviewer has asked for uncertainty estimates for the input parameter values used in the analyses of Sections 6.3 and 6.4. However, conservatism inherent in the methodology itself must also be considered. For example, there are conservatisms in the modelling assumptions regarding the release (instantaneous release of the total contents of a railroad car). Another conservatism in the methodology is the assumption of no operator action to manually isolate the control room (see Item 2 above).

In summary, we believe that the analysis results and qualitative treatment of uncertainties contained in YAEC-1759 satisfy the requirements of SRP 2.2.3. As stated by SRP 2.2.3:

> "Because of the difficulty of assigning accurate numerical values to the expected rate of unprecedented potential hazards generally considered in this review plan, judgement must be used as to the acceptability of the overall risk presented."

We believe that the methodological conservatism and the large margins between the results of Section 6.4 and the SRP acceptance criteria are sufficient to make the necessary judgements. We are, however, providing the following additional information, as requested, regarding numerical uncertainty for input parameters.

<u>Annual Railroad Accident Rate</u>

This is an annual average value for all railroads for the most recent five years of data available (1984 through 1988). We used the most recent data period because the trend for railroad accident rates has shown a decrease each year over the last decade. Consequently, the last five years ,in our judgement, are more representative of present and future accident rates. The largest accident rate between 1984-1988 was 6.58E-06 per year, the smallest was 4.55E-06 per year, with the average being 5.40E-06 per year.

<u>Annual Number of Shipments</u>

The annual number of chlorine shipments (60) is based on a 1990 survey of the two adjacent railroads. A similar survey in 1980 of the same railroads showed about twice as many chlorine transits (127). We consider the larger number as an upper bound because of two important changes that occurred during the last decade. First, the Springfield Terminal (formerly the Boston & Maine) railroad has rerouted rail traffic to other lines having more desirable shipping rates or interchange connections. And second, marketing trends and new manufacturing processes that use less hazardous materials have changed the types and amounts of material transported by both the Springfield Track and Central Vermont railroads.

<u>Segment Length</u>

The 17 segment lengths are measured values determined from a map. The uncertainty, accordingly, is limited to instrument error, which we judge to be insignificant.

Hazardous Material Release Probability

The release probability of a hazardous material, which includes chlorine, is the annual average for all railroads from the same data base and time period described above for the annual railroad accident rate. The maximum release rate for 1984 to 1988 was 0.143 per accident, the minimum was 0.093 per accident, and the average was 0.124 per accident.

Significant Chlorine Release Probability

This value is calculated from chlorine accident data compiled during the years 1971 through 1989 by the U.S. Department of Transportation. To be significant, a release must be of sufficient volume to produce toxic limits in the Control Room. However, nine of the seventeen segments in the Vermont Yankee analysis are at distances far enough away from the Control Room intake to prevent toxic levels from being reached in the event that the largest chlorine tank car releases its entire contents instantaneously. However, for conservatism, a minimum of at least one release was assumed for these nine segments. Because of the length of time for the data base (19 years) and the general stability of meteorological parameters (see below), we estimate that the band of uncertainty is plus or minus 25 percent.

Wind and Stability Frequency

This value combines the likelihood of the wind blowing in the direction of the Control Room intake and the likelihood of a stability class occurring such that toxic limits are reached in the Control Room. We reviewed the most recent five years of on-site meteorological data to assess its variability for both parameters. Each is quite stable, showing changes of about ten percent or less between any given year. We estimate that the combined wind/stability frequency is similar, but place an uncertainty band of plus or minus 25 percent on the combined frequency for conservatism.

Number of Shutdown Challenges per Year

Page 21 of YAEC-1759 uses a value of 16 challenges per year. This value is the sum of estimates for number of scrams per year and number of occurrences of operator action to prevent a demand for scram. Based on engineering judgement, we estimate that the lower and upper bounds for this parameter are approximately 5 and 20, respectively.

Duration of Operator Incapacitation

Based on the discussion of Item 2 above, we believe that the four-hour duration assumed on page 21 of YAEC-1759 is reasonable.

Also, based on the discussion of Item 2 above, we estimate that the lower and upper bounds for this parameter are zero hours and eight hours, respectively.

Coolant Injection Failure

Pages 21-23 of YAEC-1759 address the probability of core coolant injection failure, given a plant trip and the demand for emergency cooling systems. HPCI and RCIC are conservatively assumed to fail. Thus, the probability of emergency core cooling failure is based on the probability that either ADS fails, or that both LPCI and Core Spray fail. System failure probabilities were estimated based on PRA studies for other plants, and the values were conservatively adjusted for plant specific differences between these plants and Vermont Yankee. The combined probability of core cooling failure was estimated in YAEC-1759 as 2.8E-03. Based on engineering judgement, we estimate that the lower and upper bounds for this parameter are 1E-04 and 1E-02, respectively.

Containment Heat Removal Failure

Page 24 of YAEC-1759 addresses the probability of containment heat removal failure, given a plant trip and loss of the main condenser. A plant trip is assumed to result in MSIV closure, such that all plant trips are conservatively assumed to result in loss of the main condenser and require success of the containment heat removal function. The probability of loss of containment heat removal was also based on PRA evaluations for other plants. For conservatism, we took no credit for recovery from hardware failures or any other action that would need to be accomplished outside the Control Room. The resultant probability for loss of containment heat removal used in YAEC-1759 was 4E-0[illegible]. Based on engineering judgement, we estimate that the lower and upper bounds for this parameter are 8E-05 and 2E-03, respectively.