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REPLY TO:
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September 7, 1984
FVY 84-108

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

Attention: Office of Nuclear Reactor Regulation
Mr. Domenic B. Vassallo, Chief
Operating Reactors Branch No. 2
Division of Licensing

References: (a) License No. DPR-28 (Docket No. 50-271)
(b) Letter, VYNPC to USNRC, Proposed Change No. 119 to Facility Operating License No. DPR-28, dated March 26, 1984
(c) Letter, USNRC to VYNPC, NVY 84-137, dated June 21, 1984

Subject: Main Steam Line High Flow Setpoint Technical Specifications

Dear Sir:

By letter dated March 26, 1984 [Reference (b)], we requested an amendment to our Facility Operating License to modify the plant Technical Specifications for the high Main Steam line flow trip setpoint. By letter dated June 21, 1984 [Reference (c)], you requested additional information to complete your review of our amendment request.

The purpose of this letter is to provide you with the enclosed information in response to the concerns raised in your request as they apply to the Reference (c) amendment submittal. We trust that this information will allow you to complete your review of our request; however, should you need additional information, please contact us.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

R W Capstick

R. W. Capstick
Licensing Engineer

JBS/kg

Enclosure

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RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMTION

There was no mention of instrument uncertainties in the safety analysis [Reference (1)] to support the 140% high flow setpoint, since instrument uncertainties are accounted for by plant procedures. Table 1 lists the procedure numbers for all instruments involved in the analysis. These procedures specify the range of allowable trip settings, and account for instrument accuracy and drift. This practice ensures that adequate margin exists between the "analytical setpoints" (upon which the upper limits of the plant Technical Specifications are based) and the actual instrument settings at the plant. Thus, the safety analysis supports the upper limit of 140% steam flow for the high flow setpoint and the related plant procedure will specify the range of the trip setting taking into account instrument accuracy and drift.

Independent of the above, there is sufficient margin in the safety analyses for the proposed 140% high flow setpoint to more than account for instrument uncertainties. Inherent margin for the Design Basis Main Steam Line Break, Bounding Small Break, and Break Spectrum analyses are discussed separately below.

Design Basis Main Steam Line Break Analysis

The analysis for this accident appears in Section 14.6.5 of the Vermont Yankee FSAR. The analysis assumes that 200% of rated steam flow is passing through the break at time zero, which is the maximum permitted by the steam line flow limiters. A 0.5-second delay is assumed before tripping the Main Steam Isolation Valves (MSIVs) to close. This 0.5-second delay accounts for the time it takes for the steam flow to reach 200% at the steam line flow restrictor differential pressure sensor location due to the fluid inertia, and includes the instrument response time. Thus, the assumptions used in the FSAR analysis, which are based on 200% of rated steam flow, are still very conservative for a 140% high flow isolation setpoint. This conservatism more than accounts for the instrument uncertainty, which is given in the FSAR as $\pm 2\%$.

Bounding Small Break Analysis

The safety analysis [Reference (1)] states that, for the Bounding Small Break analysis, a high flow setpoint of 140% is used and 40% of the total rated steam flow is discharged out the break for ten minutes. However, a setpoint of 145.3% was conservatively assumed, and 45.3% of total rated steam flow was assumed to be discharged out the break for 10 minutes. This follows directly given that rated steam flow for Vermont Yankee is 1786.11 lbm/sec, and the calculated mass loss given in the safety analysis is 486,000 lbm:

$$1786.11 \frac{\text{lbm}}{\text{sec}} \times 600 \text{ sec} \times 45.3\% = 486{,}000 \text{ lbm.}$$

In addition to this conservatism, the radiological consequences of this Bounding Small Break are about five times less severe than for the Design Basis Main Steam Line Break accident. The total mass loss for the Bounding

Small Break is greater than for the Design Basis Main Steam Line Break accident. However, steam is the only effluent released for the Bounding Small Break. For the Design Basis Main Steam Line Break accident, 45,000 lbm liquid and 15,000 lbm steam are released. Since one lb of liquid is roughly equivalent to 50 lbs of steam in terms of the limiting (thyroid inhalation) radiological dose, it follows that there is a large (about 500%) margin to the results of the Design Basis Main Steam Line Break accident.

It should be noted that the analysis is non-mechanistic and does not account for the system response. Should such a steam flow actually occur, the Reactor Protection System would be actuated on low water level within the first minute of the accident.

These conservatisms more than account for the instrument uncertainty, which is given in the FSAR as $\pm 2\%$.

Break Spectrum Analysis

This analysis was performed as a more realistic assessment of the mass loss that would be expected for a break in the steam tunnel. A spectrum of break sizes was analyzed, and a "bounding mass loss curve" was developed (see Figure 2 of Reference 1). The curve is based on an automatic isolation at 200°F for break flows greater than 20 lbm/sec, and a 160°F alarm plus ten-minute operator action time for smaller break flows.

The maximum mass loss on the "bounding mass loss curve" is 12,360 lbm of steam, and occurs for a break size of 20 lbm/sec. It is important to note that this value is very conservatively bounded by the 486,000 lbm loss calculated in the Bounding Small Break analysis.

Using temperature setpoints that are higher than 160°F and 200°F, respectively, would shift the "bounding mass loss curve" upwards. The uncertainty of the temperature sensors is approximately ± 10°F. The mass loss for each break size was re-evaluated using Figure 1 of the safety analysis (Reference 1), assuming temperature settings of 170°F and 210°F. The peak mass loss on the resulting "bounding mass loss curve" again occurs for a break size of 20 lbm/sec and is about 12,600 lbm. This is only slightly higher than the 12,360 lbm loss calculated from the "bounding mass loss curve" based on 160°F and 200°F settings, and much less than the 486,000 lbm loss calculated in the Bounding Small Break analysis. Note also that, as discussed previously, the radiological consequences of the Bounding Small Break analysis are very conservatively bounded by the radiological consequences for the Design Basis Main Steam Line Break accident.

Thus, we conclude that the results of the Break Spectrum analysis demonstrate margin which is more than adequate to account for instrument uncertainties.

75% Power Analysis

In addition to the above analyses to support a 140% high flow isolation setpoint, an analysis was performed to support quarterly MSIV testing at up to 75% power.

This analysis differs from a steam line break analysis in several ways. First, this analysis is not part of the safety design basis for any of the setpoints involved. Even if one of the setpoints was reached and a reactor isolation and/or scram occurred, no safety limit would be exceeded. Secondly, lower setpoint values produce more conservative results for this analysis, since the goal is to avoid reaching the trip setpoints. However, only upper limits for the high steam flow, high flux, and high pressure setpoints are provided in the Technical Specifications, since only the upper limits are involved in satisfying the safety design bases.

Given the above, we felt it was appropriate to perform a nominal analysis using the lower limit of the allowable values for each setpoint, as specified in plant procedures. The results show that the high flow isolation setpoint, and APRM high flux and reactor high pressure scram setpoints are not reached. If the setpoints are further reduced by the following instrument uncertainties:

High Flow Setpoint:	-2%
APRM Scram Setpoint:	-3%
High Pressure Scram Setpoint:	-5 psig

the results still show margin such that a trip would be avoided.

Analytical Uncertainties

The Design Basis Main Steam Line Break analysis, as described in Section 14.6.5 of the FSAR, remains unchanged. Analytical uncertainties are accounted for by the conservative assumptions which are made in performing the analysis.

The Bounding Small Break analysis accounts for analytical uncertainties through the use of conservative assumptions for the high steam flow setpoint and operator action time. These are the only two parameters that affect the calculated mass loss for this analysis.

As stated in the safety analysis, the Break Spectrum analysis was performed as a "best estimate" analysis. Because this analysis is very conservatively bounded by the Bounding Small Break analysis, and because the Break Spectrum analysis was intended as a best estimate analysis, we do not feel that a discussion of analytical uncertainties is appropriate.

Finally, the 75% power analysis was performed with our Vermont Yankee RETRAN model. Results using the same modeling techniques were shown to be conservative for pressurization transients when compared to the Peach Bottom turbine trip transient test data (References 2 and 3). The single MSIV closure transient is a similar pressurization transient. Thus, the inherent conservatisms of the model account for analytical uncertainties.

List of References

1. General Electric Company, "Safety Evaluation of the Proposed 140% Main Steam Line Flow Trip Setting for the Vermont Yankee Nuclear Power Station", July 1982.
2. A. A. F. Ansari and J. T. Cronin, "Methods for the Analysis of Boiling Water Reactors - A Systems Transient Analysis Model (RETRAN)", YAEC-1233, April 15, 1981.
3. Letter from Vernon L. Rooney to R. L. Smith, Docket No. 50-271, November 27, 1981.

TABLE 1

Procedure Numbers for Instruments Involved in Proposed 140% High Flow Setpoint Analysis

Instrument Function	Plant Procedure Number
Main Steam Line High Flow Isolation	O. P. 4323
Steam Line Tunnel High Temperature Alarm	R. P. 4394
Steam Line Tunnel High Temperature Isolation	O. P. 4322
APRM High Flux Scram	O. P. 4302
Reactor High Pressure Scram	O. P. 4312