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Docket No. 50-271
BVY 06-051

TAC No. MC0761

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: **Vermont Yankee Nuclear Power Station**
Summary of Reactor Feedwater Pump Trip Analysis

References:
1) Letter, Entergy to USNRC, "Vermont Yankee Nuclear Power Station, License No. DPR-28 (Docket No. 50-271), Technical Specification Proposed Change No. 263, Extended Power Uprate," BVY 03-80, dated September 10, 2003

2) Letter, USNRC to Entergy, "Vermont Yankee Nuclear Power Station – Issuance of Amendment RE: Extended Power Uprate (TAC No. MC0761)," NVY 06-028, dated March 2, 2006

This letter provides information pursuant to a License Condition established in connection with the application by Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (Entergy) for a license amendment (Reference 1, as supplemented and approved by Reference 2) to increase the maximum authorized power level of the Vermont Yankee Nuclear Power Station from 1593 megawatts thermal (MWt) to 1912 MWt.

License Condition 3.L.2 requires that within 30 days at nominal full-power operation following successful performance of the transient test discussed in License Condition 3.L.1, that Entergy, through performance of additional testing and/or analysis of the testing results, confirm that the loss of one reactor feedwater pump will not result in a reactor trip.

Attachment 1 includes a summary of the analysis performed to satisfy License Condition 3.L.2. Entergy's analysis has concluded that the loss of a feedwater pump will not result in a reactor trip and based on this no additional testing is planned.

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There are no new regulatory commitments contained in this submittal.

If you have any questions or require additional information, please contact Mr. James DeVincentis at (802) 258-4236.

Sincerely,

Ted A. Sullivan
Site Vice President
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Attachment (1) - Summary of Reactor Feedwater Pump Trip Analysis

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Attachment 1

Vermont Yankee Nuclear Power Station

Summary Reactor Feedwater Pump Trip Analysis

License Condition 3.L.2 requires that within 30 days at nominal full-power operation following successful performance of the transient test discussed in License Condition 3.L.1, that Entergy, through performance of additional testing and/or analysis of the testing results, confirm that the loss of one reactor feedwater pump will not result in a reactor trip.

The following discussion summarizes the results of the analysis which confirms that the loss of one reactor feedwater pump will not result in a reactor trip at the plant's new power rating of 1912 MWt. The analysis summary is presented in three parts:

- Summary of Condensate Pump Trip test performed in accordance with License Condition 3.L.1.
- Benchmarking of Dynamic Analysis Model using Condensate Pump Trip Test data.
- Analysis of Feedwater Pump Trip using benchmarked Dynamic Analysis Model.

Summary of Condensate Pump Trip

To ensure acceptable performance during a condensate or reactor feedwater pump trip at the new 1912 MWt power rating, Entergy implemented the following modifications:

- The Reactor Recirculation Controller was modified to initiate an automatic runback of recirculation flow, and thereby rapidly reduce reactor power, upon detection of a pump trip at high reactor power levels.
- The Reactor Feedwater Pump (RFP) suction pressure trip protection was enhanced by installing a staggered pump trip scheme and revised trip setpoints. This modification is intended to reduce the chance of inadvertent loss of all feedwater pumps.
- The "B" RFP trip scheme was modified to automatically trip the "B" RFP if any Condensate pump trips while at high power levels. This modification is intended to increase margin to the RFP suction pressure trip setpoints for the remaining two operating RFPs, thereby reducing the chance of a loss of all feedwater pumps for this event.
- Finally, the Reactor Feedwater Level Controller was tuned to improve the responsiveness of the feedwater regulating valves, and the controller logic was modified to automatically reduce the level controller setpoint by approximately 5 inches upon initiation of a reactor recirculation runback due to a pump trip. This modification improves margin to the high reactor water level turbine trip setpoint during a pump trip event and thus is intended to reduce the chance of a reactor scram on a pump trip.

On the morning of May 8, 2006, while operating at the new power level of 1912 MWt, Entergy performed a Condensate Pump Trip Test in conformance with License Condition 3.L.1. The objective of the test was to demonstrate that at the new power rating, adequate reactor feedwater pump suction pressure remains available during this transient to preclude the loss of all feedwater pumps due to low suction pressure.

Figures 1 and 2 below illustrate the plant response during the test

Figure 1 - Condensate Pump Trip Test

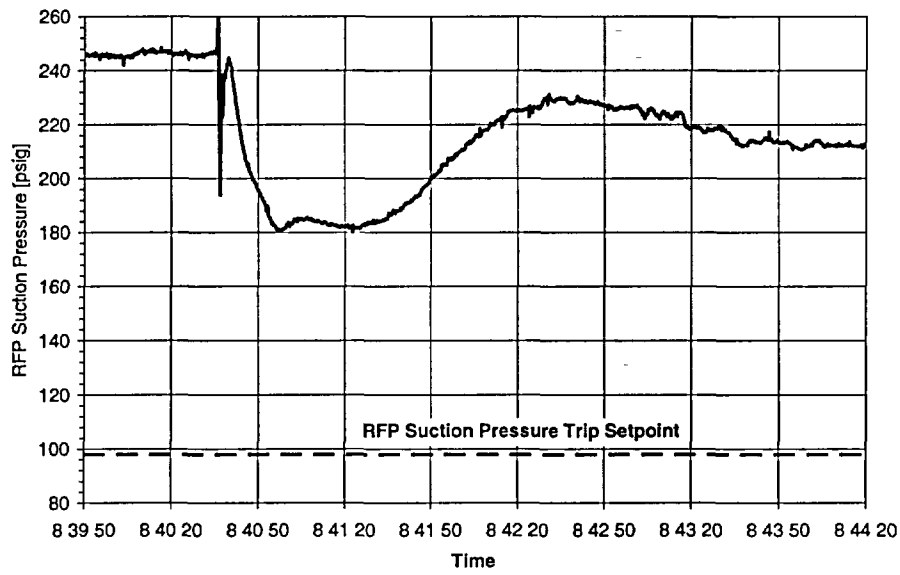


Figure 2 - Condensate Pump Trip Test

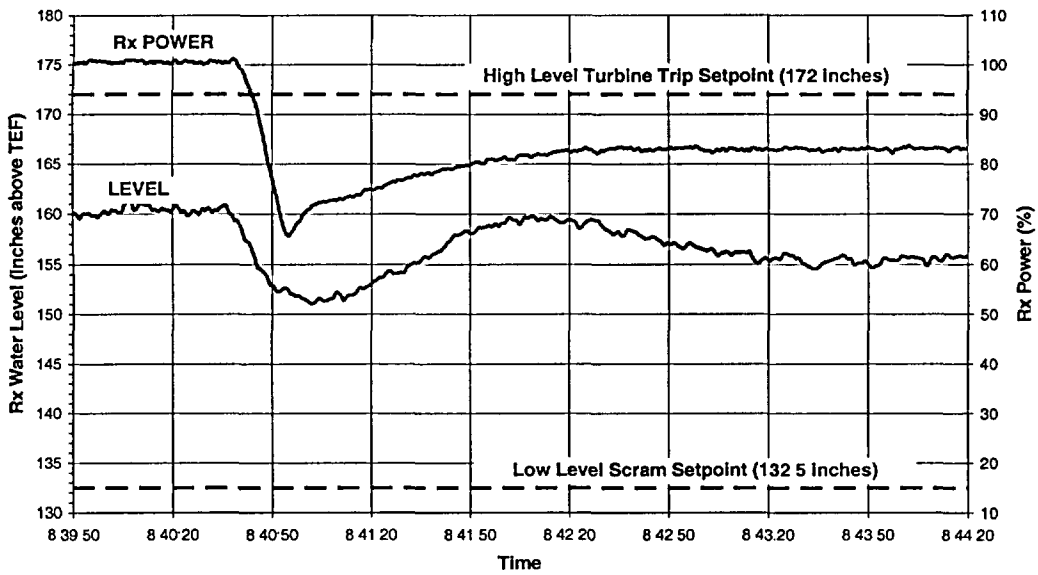


Figure 1 indicates that the minimum RFP suction pressure, during the Condensate Pump Trip demonstration was approximately 180 psig. Therefore, there is ample margin to the 98 psig suction pressure trip setpoint. Figure 2 shows that the plant's reactor level response had ample margin to both the low level scram setpoint (132.5 inches) and the high level turbine trip setpoint (172 inches). This is as expected based upon the predicted plant response as discussed below.

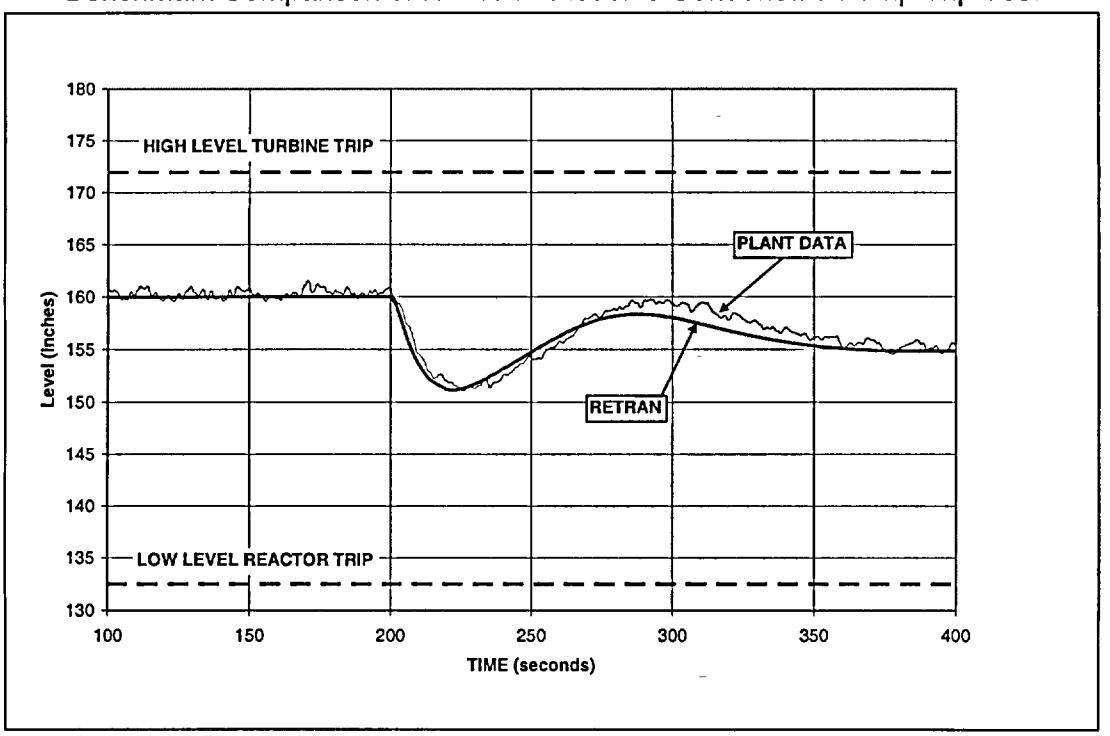
Benchmarking of Dynamic Analysis Model

A dynamic analysis model using RETRAN was developed to evaluate reactor level response during a condensate and/or feedwater pump trip event at 1912 MWt.

Prior to the condensate pump trip test, the RETRAN model was benchmarked to the plant data and the condensate pump trip test was simulated. The effect of uncertainties in various inputs was estimated to be approximately 2 to 3 inches. The predictions were within 2 inches of the low level and within less than 1 inch of the high level test results.

After the condensate pump trip test was performed, the RETRAN model was further refined for the dynamic level difference inside and outside the dryer skirt, and the initial conditions were revised to better represent the plant conditions at the time the condensate pump trip test was performed. The comparison of refined RETRAN model prediction to the measured level during actual condensate pump trip test is shown in Figure 3. Figure 3 shows good agreement between RETRAN model prediction and actual test data.

Figure 3
Benchmark Comparison of RETRAN Model to Condensate Pump Trip Test

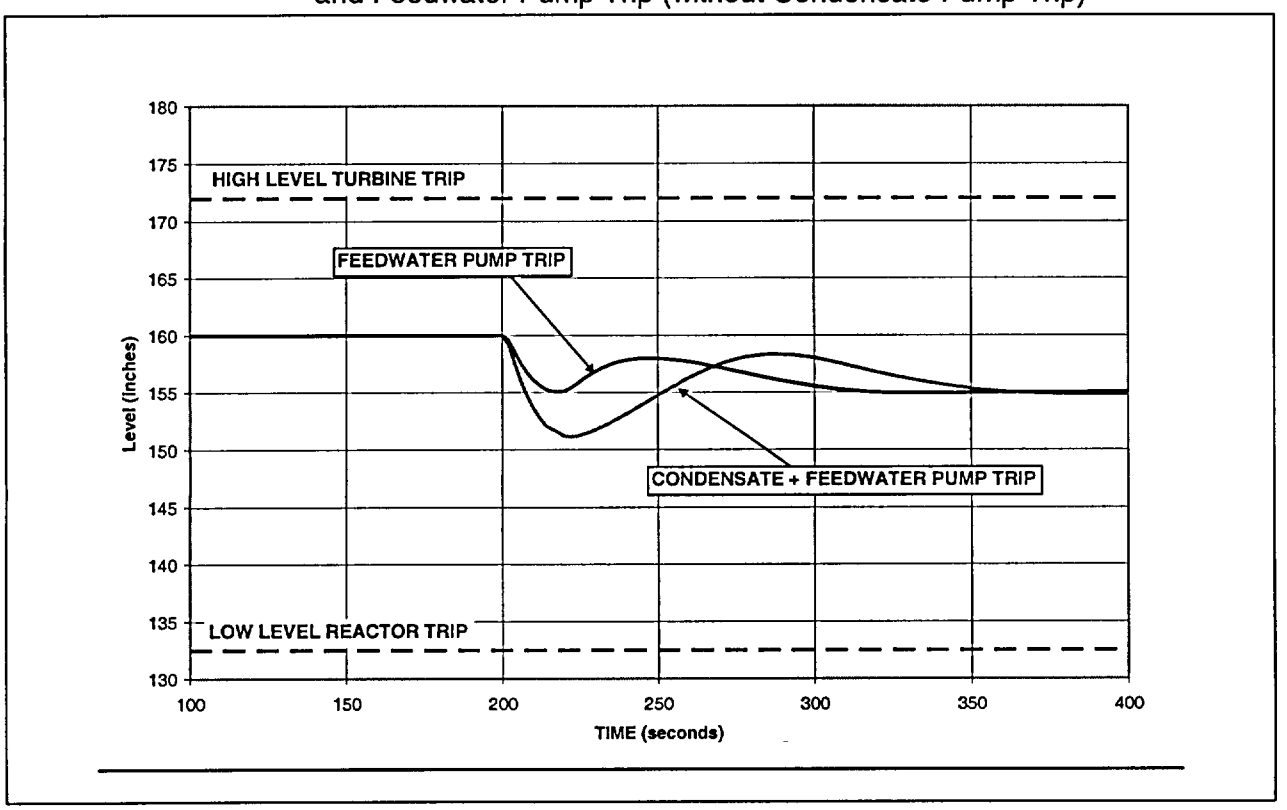


Analysis of Reactor Feedwater Pump Trip

The same RETRAN model was used to simulate a feedwater pump trip. The calculated level for a feedwater-only pump trip is compared to the level calculated for the condensate and feedwater pump trip in Figure 4. It can be seen that the margin to the low level trip setpoint is higher in the case of a feedwater-only pump trip. This is a reasonable outcome since the reduction in the feedwater flow rate is less in the case of a feedwater pump trip than it is in the case of a condensate plus feedwater pump trip. The margin to the high level turbine trip setpoint is comparable in both cases. The magnitude of the level peak depends on the interaction between how aggressively the feedwater controller compensates for the flow rate decrease and how fast the level decreases as a result of the reduction in the feedwater flow rate. It is a reasonable outcome that the level peaks are comparable in both cases.

Figure 4

RETRAN Model Predictions for Both Condensate Pump Trip (with automatic FW Pump Trip) and Feedwater Pump Trip (without Condensate Pump Trip)



Conclusions

The RETRAN analysis results in Figure 4 above show that the minimum level following a feedwater-only pump trip is 155 inches, and the peak level is 158 inches. There is a 14 inch margin to the high level turbine trip setpoint of 172 inches, and a 22.5 inch margin to the low level reactor scram setpoint of 132.5 inches. The uncertainties in the results are estimated to be approximately 2 to 3 inches. These results show ample margin to both the high level turbine trip setpoint and the low level reactor scram setpoint and therefore there is reasonable confidence that the loss of one reactor feedwater pump will not result in a reactor trip.