Entergy

Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
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Michael A. Balduzzi
Site Vice President

February 25, 2004

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
1 White Flint North
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
Docket No: 50-283
License No: DPR-35

Response to Request for Additional Information on Pilgrim Request for NRC Approval of Engineering Evaluation of Elevated Safety Relief Valves' Discharge Pipe Temperatures (TAC No. MC1799)

LETTER NUMBER: 2.04.018

REFERENCE: Entergy Letter, Request for NRC Approval of Engineering Evaluation of Elevated Safety Relief Valves' Discharge Pipe Temperatures, dated January 16, 2004

Dear Sir or Madam:

The attachment to this letter provides Pilgrim's response to NRC Request for Additional Information related to Pilgrim's request under the referenced letter. The attached response was discussed with the NRC staff during a telephone call on February 13, 2004. This response does not impact the no significant hazards consideration determination (10 CFR 50.92(c)) provided in the referenced letter.

There are no commitments contained in this letter.

If you have any questions or require additional information, please contact Mr. Bryan Ford, Licensing Manager, at (508) 830-8403.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 25th day of February 2004.

Sincerely,

Michael A. Balduzzi

Attachment: Response to Request for Additional Information on Pilgrim Request for NRC Approval of Engineering Evaluation of Elevated Safety Relief Valves' Discharge Pipe Temperatures (6 pages)

A047

cc: Mr. Travis Tate, Project Manager
Office of Nuclear Reactor Regulation
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Senior Resident Inspector
Pilgrim Nuclear Power Station

ATTACHMENT TO ENTERGY LETTER NO. 2.04.018
PILGRIM RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION ON PILGRIM REQUEST FOR NRC APPROVAL OF ENGINEERING EVALUATION OF ELEVATED SAFETY RELIEF VALVES' DISCHARGE PIPE TEMPERATURE TAC NO. MC1799

NRC Question 1:

In Section 3, subsection titled, "Impact on Nuclear Safety," it is stated that the combined effect of a 10% increase in the nominal setpoint on all four SRVs is 30 psig. Does this mean a 2.5% setpoint drift is assumed for each SRV? Also, please explain the basis for this assumption.

Entergy Response:

A 10% increase in the nominal setpoint of each of the four SRVs results in a peak pressure increase of 30 psi. This pressure difference is based on sensitivity analysis performed on PNPS using the standard reload licensing model and assumptions with varying SRV setpoints or response time (Ref. 3 of original submittal, Section 6). Although, the sensitivity analysis model is not entirely consistent with the current plant, the analysis is believed to provide a valid prediction of the relative change in pressure from incremental setpoint drift. Assuming 1% drift of each SRV the setpoint would equal the Technical Specification limit. At the Technical Specification setpoint limit, the sensitivity analysis resulted in a peak vessel pressure of 1330 psig. Assuming 10% drift of each SRV, the sensitivity analysis resulted in a peak vessel pressure of 1360 psig, a difference of 30 psi.

NRC Question 2:

In Section 3, subsection titled, "Impact on Nuclear Safety," it is stated that the combined effect of a response time delay of 0.9 sec. on two SRVs is 10 psig. Please clarify whether 0.9 sec. delay was assumed for each SRV, and provide the basis for this assumption.

Entergy Response:

Testing performed by Target Rock Corporation showed that gross leakage may increase the delay time for pilot valve actuation by a maximum of 0.5 seconds relative to standard reload licensing analysis which assumes a delay time of 0.4 seconds. Therefore, the delay time after gross leakage has occurred could be as high as 0.9 seconds (Ref. 3 of original submittal, Section 6.3). The engineering evaluation submitted for this license amendment considered that each of two SRVs are delayed by 0.9 seconds. The sensitivity analysis discussed in the response to question 1 was used to estimate the effect of a 0.9 second delay on all four SRVs. The analysis of four delayed SRVs, resulted in a 21 psi increase in the peak vessel pressure (Ref. 3, Section 6.3 of original submittal). That pressure change was reduced to 10 psi for two SRVs. The 21 psi increase is conservative because it occurs at a leakage rate of 300 lb/hr. The steady state tailpipe temperature limit of 235°F corresponds to a pilot leakage limit of 75 lb/hr. At this steady state leakage rate, TRC test results indicate a potential increase in response time of 0.55 seconds which is only 0.15 seconds higher than the standard value used in analysis of 0.4 seconds (Ref. 3, Figure 5-3 of original submittal). Testing performed on PNPS pilot assemblies that had previously leaked and were operated within the proposed limits resulted in a statistical pilot valve time delay equal to 0.5 seconds, only slightly above the analysis value of 0.4 seconds.

As-found stroke time testing performed on SRVs indicates that the main disc stroke time is typically 0.025 seconds as compared to the analysis input of 0.15 seconds which provides a margin of 0.125 seconds in overall valve response which is applicable to each of the four SRVs. Thus the observed 0.1 second increase in pilot valve operation is completely offset by the observed 0.125 decrease in main stage operating time and the total valve opening time is less than assumed in the analysis. While test results indicate the potential effects of leakage on valve response time are relatively minor and could justifiably be neglected, consideration of an increased response time is conservative and provides a bounding estimate of the peak vessel pressure.

NRC Question 3:

The calculated peak vessel pressure for the limiting ATWS was 1495 psig. In light of the fact that the calculated value is sufficiently close to the ASME acceptance criteria of 1500 psig, please explain whether a delayed response time was also assumed in addition to SRV setpoint drift while performing this calculation. If so, how many seconds were assumed for the response time?

Entergy Response:

ATWS analysis performed for the TPO power uprate to determine peak vessel pressure, assumed a SRV opening time delay of 0.4 seconds and a main disc stroke time of 0.15 seconds for a total delay between the start of pilot motion and completion of main disc motion of 0.55 seconds. These values are the standard for reload licensing analysis and no additional delays were assumed. Other conservatisms in the analysis justify neglecting the potential pilot valve actuation time delay increase of 0.15 seconds described in the response to question 2. Examples of these conservatisms are margin between the assumed setpoint for the SRVs and the analysis input value, margin between the typical SRV opening time and the analysis input value, and margin in the rate of pressure rise as compared to the rate used to measure the increase in delay on leaking SRV pilots.

In the ATWS analysis, three SRV setpoints were assumed to have drifted upward 1% (1126 psig) and for conservatism one SRV was assumed to have drifted upward 1.8% (1136 psig). The steady state operational tail pipe temperature limits are designed to limit the setpoint drift to less than 1% on the leaking SRVs. Two SRVs remain leak tight and are unaffected by leakage.

As discussed in question 2, the observed 0.1 second increase in pilot valve operation is completely offset by the 0.125 decrease in main stage operating time and the total valve opening

time is less than assumed in the analysis.

As discussed the response to question 2, the maximum response time delay of 0.9 seconds is associated with at leakage rate of 300 lb/hr and a 0.55 second delay is associated with a 75 lb/hr. Each of these delay times are derived from testing that used a 60 psi/sec rate of pressure rise or ramp rate (Ref. 3 of original submittal, Section 3.2). ATWS analysis results indicate a higher ramp rate of approximately 90 psi/sec (Ref. 18 of original submittal). This higher ramp rate provides more motive force to open the pilot in a shorter period of time, thus reducing the delay time.

As stated in the response to question 2, for conservatism, a pressure increase for increased delay was included in the assessment of leakage on the overpressure protection transient (MSIV closure flux scram event). Although, the ATWS analysis does not include this potential delay, test results and conservatism in other inputs provides an adequate level of overall conservatism in this analysis. On this basis, the ATWS analysis performed for the TPO power uprate includes adequate conservatism with regard to SRV performance characteristics and peak vessel pressure prediction.

NRC Question 4:

Please provide an estimate of the total leakage rate (lb/hr) through the SRVs, and its impact on Torus water temperature from the standpoint of ATWS requirement.

Entergy Response:

The total leakage through the SRVs is limited to 150 lb/hr. This amount of leakage adds a minor amount of heat to the torus water during power operations. The torus water temperature is limited to maximum of 80°F and is routinely maintained below this limit using RHR suppression pool cooling. ATWS analysis contained in NEDE-24223 "Assessment of BWR/3 Mitigation of ATWS (Alternate 3)" is the generic analysis performed for a representative BWR 3 with a Mark I containment. This containment analysis contained in NEDE-24233 is considered the licensing analysis for PNPS with respect to the ATWS rule 10CFR50.62. The initial suppression pool temperature used in NEDE-24233 is 90°F. Therefore, because PNPS maintains the suppression pool water temperature well below 90°F, there is no impact on torus water temperature from the standpoint of ATWS requirements.