February 21, 2001

Mr. Mike Bellamy
Site Vice President
Entergy Nuclear Generation Company
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

SUBJECT: COMPLETION OF REVIEW OF ENGINEERING EVALUATION FOR LEAKING SAFETY RELIEF VALVE SRV-203-3B AT THE PILGRIM NUCLEAR POWER STATION (TAC NO. MB0874)

Dear Mr. Bellamy:

By letter dated December 27, 2000 (ENGC Letter 2.00.82), the Entergy Nuclear Generation Company (the licensee) requested that the U.S. Nuclear Regulatory Commission (NRC) review and approve its engineering evaluation of an elevated tailpipe temperature on safety relief valve (SRV) 203-3B. NRC approval of the evaluation is required by Technical Specification (TS) 3.6.D.4 for continued power operation beyond 90 days from initial discovery of discharge pipe temperatures in excess of 212°F for more than 24 hours.

The staff has completed its review of the licensee's engineering evaluation for elevated tailpipe temperature. The staff has determined that the proposed temperature limits for the SRV-203-3B tailpipe are conservative such that the SRV will remain capable of performing its intended function. The staff's safety evaluation approving continued plant operation is enclosed. This completes our action on this request; and, we consider TAC No. MB0874 to be complete.

If you have any questions regarding this matter, please contact me at (301) 415-1445.

Sincerely,

/RA/

Alan B. Wang, Project Manager, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-293

Enclosure: Safety Evaluation

cc w/encl: See next page

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Alan B. Wang, Project Manager, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-293

Enclosure: Safety Evaluation Report

cc w/encl: See next page
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SAFETY EVALUATION BY THE

OFFICE OF NUCLEAR REACTOR REGULATION

REVIEW OF ENGINEERING EVALUATION REQUIRED BY TECHNICAL

SPECIFICATION 3.6.D.4 FOR LEAKING SAFETY RELIEF VALVE 203-3B

PILGRIM NUCLEAR POWER STATION

DOCKET NUMBER 50-293

1.0 INTRODUCTION

By letter dated December 27, 2000, Entergy Nuclear Generation Company (the licensee) requested U.S. Nuclear Regulatory Commission (NRC) review and approval of their engineering evaluation of an elevated tailpipe temperature on safety relief valve (SRV) 203-3B. NRC approval of this evaluation is required by Pilgrim Nuclear Power Station (Pilgrim) Technical Specification (TS) 3.6.D.4 which states, in part, "Power operation shall not continue beyond 90 days from the initial discovery of discharge pipe temperatures in excess of 212°F for more than 24 hours without prior NRC approval of the engineering evaluation delineated in 3.6.D.3." TS 3.6.D.3 states, "If the temperature of any safety relief discharge pipe exceeds 212°F during normal reactor operation for a period of greater than 24 hours, an engineering evaluation shall be performed justifying continued operation for the corresponding temperature increases." The temperature of SRV 203-3B exceeded 212°F on November 26, 2000, and 90 days from that date would be February 24, 2001.

2.0 EVALUATION

The licensee stated in the December 27, 2000, submittal, that on November 26, 2000, the tailpipe temperature associated with SRV 203-3B reached and has remained in excess of 212°F since that time. The tailpipe temperature later reached 216°F where it has remained stable. The licensee has correlated tailpipe temperature to leakage based on a conservative analysis using thermodynamic and heat transfer principles. This analysis determined that for temperatures below 215°F, there would be insignificant leakage. The licensee has proposed that the leaking SRV tailpipe temperature be allowed to increase such that if the tailpipe temperature exceeds 235°F for a period greater than 24 hours or exceeds 250°F at any time, then an orderly shutdown of the reactor shall commence and the plant shall be less than 104 psig within 24 hours. The licensee has determined that the leakage associated with these higher tailpipe temperatures would not affect the ability of the SRV to perform its intended function as discussed below.

Enclosure

The licensee has determined that there are two possible steam leakage paths through the SRV into the discharge pipe -- either through the main stage, or through the pilot stage. Main stage leakage, although less common than pilot stage leakage, may increase at a more rapid rate. The licensee has determined that leakage across the main stage will not affect the ability of the SRV to operate in either the pressure actuated, or power actuated modes, and that leakage across the main stage should not cause the SRV to inadvertently open and cause a rapid depressurization or fail to reclose after operating. However, the licensee has determined that pilot leakage can affect the setpoint drift and the response time of the SRV. Tests have been performed on leaking SRVs with leakage up to 1,000 LB/HR. Test results indicate that the setpoint pressure increased by approximately 1% at 225 LB/HR and by 2% at a leakage rate of approximately 400 LB/HR. The setpoint then decreased 2% per 100 LB/HR of additional leakage. Also, the valve response time increased with leakage to a maximum value of 0.9 second compared to 0.4 second for a non-leaking valve.

Assuming the SRV leakage is pilot leakage, General Electric (GE) has performed sensitivity analyses on the Pilgrim reactor coolant transients and has determined that an increased setpoint (+1%) and response time (0.9 second) due to a leakage of 225 LB/HR is acceptable. This leakage correlates to a tailpipe temperature of 255°F, which bounds the maximum allowable value of 250°F proposed by the licensee. These analyses demonstrate that maximum system pressure remains below the upset limit of 1375 psig, and there is a minimal effect on critical power thermal margin. The licensee also evaluated the effects of the slightly higher ambient air temperature environment around the SRV air solenoid valve as a result of the SRV leaking condition and determined that it has no appreciable effect on the environmental qualification of the air solenoid valve.

TS surveillance 4.6.D.3 requires that SRV tailpipe temperature be logged daily. As a compensating measure for the leaking SRV, the licensee has committed to increase the frequency of this measurement to once per hour. The staff also notes that TS 3.7 requires measurement of torus and drywell temperatures and limits plant operations for temperatures above specific limits and that TS 3.6.D.4 requires the SRV be removed for testing and recalibration at the next cold shutdown greater than 72 hours in duration. The testing and recalibration must meet the provisions of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, which requires that the leak be repaired prior to returning the valve to service.

By letter dated February 20, 2001, the licensee committed to the above compensatory measures. One of these commitments is to commence an orderly shutdown of the reactor to less than 104 psig within 24 hours if the SRV 203-3B tailpipe temperature exceeds 235 °F for a period greater than 24 hours or exceeds 250 °F at any time. As noted above, the licensee has provided analysis that demonstrates that it would take an increase in tailpipe temperature of greater than 255 °F before the operability of the SRV may be in question. Therefore, the compensatory measures are bounded by the licensee's engineering evaluation for determining SRV operability.

3.0 <u>CONCLUSION</u>

The licensee has satisfied the TS 3.6.D.3 requirement that an engineering evaluation be performed for the leaking SRV condition. The staff has reviewed the evaluation and has found the proposed temperature limits identified in their engineering evaluation for the SRV 203-3B tailpipe to be conservative such that the SRV will remain capable of performing its intended functions. If the tailpipe temperature exceeds these limits, the licensee will conduct an orderly shutdown as described in their February 20, 2001, letter. Further, the staff has determined that the licensee's proposed increased temperature monitoring frequency will be adequate to determine the quantity of the SRV leakage in a timely manner. Therefore, the licensee's engineering evaluation adequately justifies plant operation beyond February 24, 2001, (the end of the TS 90-day period) until the next cold shutdown of 72 hours or more.

Principal Contributor: G. Hammer

Date: February 21, 2001