



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

OFFICE OF NUCLEAR REACTOR REGULATION

REVIEW OF BOSTON EDISON COMPANY ENGINEERING EVALUATION

FOR PILGRIM NUCLEAR POWER STATION

LEAKING SAFETY RELIEF VALVE 203-3B

DOCKET NUMBER 50-293

INTRODUCTION

By letter dated January 30, 1998, Boston Edison Company (the licensee) requested 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 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." The elevated temperature was discovered December 24, 1997, and 90 days from that date would be March 24, 1998.

EVALUATION

The licensee stated in the January 30, 1998, submittal, that on December 24, 1997, the tailpipe temperature associated with SRV 203-3B reached and remained in excess of 212°F for more than 24 hours. The tailpipe temperature later reached 217°F where it has remained relatively stable. The licensee has correlated tailpipe temperature to leakage based on an adequately 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. 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.

The licensee has determined 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 1000 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 plant reactor coolant transients and has determined that the 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 it to have 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 licensee has also determined that the proposed leakage limit is not expected to cause torus water temperature or dry well temperature to change significantly; therefore, increased monitoring of these temperatures is not necessary. TS 3.7 requires measurement of these temperatures and limits plant operations for temperatures above specific limits. Also, 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.

CONCLUSION

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 for the SRV 203-3B tailpipe to be conservative such that the SRV will remain capable of performing its intended functions. 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 the 90-day period ending March 24, 1998.

Principal Contributor: G. Hammer

Date: March 19, 1998