UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR APPROVAL TO REPAIR FLAWS IN ACCORDANCE WITH GENERIC LETTER 90-05

FOR AMERICAN SOCIETY OF MECHANICAL ENGINEERS CLASS 3 SALT SERVICE WATER PIPING

BOSTON EDISON COMPANY

PILGRIM NUCLEAR POWER STATION

DOCKET NO. 50-293

1.0 INTRODUCTION

Title 10 of the Code of Federal Regulations, Section 50.55a(a) requires nuclear power facility piping and components to meet the applicable requirements of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (hereafter referred to as the Code). Section XI of the Code specifies Code-acceptable repair methods for flaws that exceed Code acceptance limits in piping that is in-service. A Code repair is required to restore the structural integrity of flawed Code piping, independent of the operational mode of the plant when the flaw is detected. Those repairs not in compliance with Section XI of the Code are non-Code repairs. However, the implementation of required Code (weld) repairs to ASME Code Class 1, 2 or 3 systems is often impractical for nuclear licensees since the repairs normally require an isolation of the system requiring the repair, and often a shutdown of the nuclear power plant.

Alternatives to Code requirements may be used by nuclear licensees when authorized by the Director of the Office of Nuclear Reactor Regulation if the proposed alternatives to the requirements are such that they are shown to provide an acceptable level of quality and safety in lieu of the Code requirements (10 CFR 50.55a(a)(3)(i)), or if compliance with the Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety (10 CFR 50.55a(a)(3)(ii)).

A licensee may also submit requests for relief from certain Code requirements when they have determined that conformance with certain Code requirements is impractical for its facility (10 CFR 50.55a(g)(5)(iii)). Pursuant to 10 CFR 50 55a(g)(6)(i), the Commission will evaluate determinations of impracticality and may grant relief and impose alternative requirements as it determines is authorized by law and will not endanger life or property and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Generic Letter (GL) 90-05, entitled "Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2 and 3 Piping," and dated June 15, 1990, provides guidance for the staff in evaluating relief requests submitted by licensees for temporary non-Code repairs of Code Class 3 piping. For the purpose of this GL, impracticality is defined to exist if the flaw detected during plant operation is in a section of Class 3 piping that cannot be isolated for completing a

Code repair within the time period permitted by the limiting condition for operation of the affected system as specified in the plant TSs, and performance of the Code repair necessitates a plant shutdown.

2.0 BACKGROUND

In a letter dated July 7, 1997, Boston Edison Company (hereafter referred to as the licensee) reported to the NRC that degradation had been identified on a piping spool piece. The spool piece was associated with Pilgrim Nuclear Power Station's (PNPC) salt service water (SSW) system. The SSW system is a moderate energy system and provides the ultimate heat sink for containment heat removal. The piping degradation involved leakage and pitting and is located on a rubber lined carbon steel pipe. The pipe is 18-inch, ASTM A53 Grade B material having nominal thickness of 0.312 inches. The licensee requested under the provisions of 10 CFR 50.55a(g)(6)(i) a relief from the ASME Code, Section XI requirements to perform Code repair or replace the degraded piping. The relief was sought until the next refueling outage which is scheduled to take place in the spring of 1999. At that time, the licensee was planning to replace the degraded piping. The licensee based its request for relief on the results of a "through-wall flaw" evaluation that was performed in accordance with the guidelines and acceptance criteria contained in GL 90-05. The NRC staff granted the relief in its Safety Evaluation dated October 1, 1997. Subsequently, the spool needed another repair because the licensee observed erosion rates greater than the one previously projected. The accelerated erosion rate was determined as a result of the surveillance conducted in accordance with a condition for granting the relief. The licensee again requested relief from the ASME Code requirements to perform a permanent Code repair. The NRC staff granted approval for the repair via telephone on November 18, 1997. Shortly following the repair, the affected spool was replaced during a forced outage that started on November 23, 1997.

3.0 LICENSEE'S RELIEF REQUEST

3.1 Components for Which Relief is Requested

The affected piping is classified as ASME Code Class 3, moderate energy piping and is a part of the SSW system. The piping spool is located immediately downstream of the MO-3806 butterfly valve and downstream of the reactor building closed cooling water heat exchanger. The line is designed to take 100 psi pressure. However, the line is open ended and there is usually a small vacuum in the pipe at this location related to the changing tides.

3.2 Section XI Edition for the Pilgrim Plant

1980 Edition of the ASME Code, Section XI including Winter 1980 Addenda.

3.3 ASME Section XI Code Requirement

The ASME Code Section XI requires that repairs or replacements of ASME Code Class components be performed in accordance with rules found in Articles IWA-4000 or IWA-7000, respectively. The intent of these rules serves to provide an acceptable means of restoring the structural integrity of a degraded Code Class system back to the original design requirements.

3.4 Content of the Relief Request

Relief is sought from performing a Code repair or replacement of the salt service water system piping per the requirements of Article IWA-4000 or IWA-7000, respectively. Relief is being sought until the next refueling outage which is scheduled to take place in the spring of 1999. The relief is being sought because performing a Code repair during plant operation was determined to be impracticable. The licensee will perform a Permanent Code repair for the affected piping during the next scheduled outage.

3.5 Basis for Relief

Request for relief has been submitted pursuant to 10 CFR 50.55a(g)(6)(i) and alternatives to the Code requirements have been proposed by the licensee. The licensee has evaluated the piping in accordance with the guidance provided in GL 90-05. Based upon the evaluation, it was established that the piping is degraded, but remains operable. The Code repair methods require removing one loop of the SSW from service and cross tying the RBCCW systems during power operation, placing the Pilgrim plant in a 24 hour limiting condition for operation (LCO) under TS section 3.5.B.3. Pilgrim has estimated the Code repair to take 4 to 5 days for completion. Therefore, the piping repair satisfies the criteria for impracticality as described in Generic Letter 90-05 as performing permanent repairs in accordance with the ASME Code during plant operation would have necessitated a Unit shutdown.

3.6 Licensee's Alternative Program

The licensee proposed a temporary Code repair to maintain the structural integrity of the piping until the piping is replaced during an outage of sufficient duration. The temporary repair consists of welding stainless steel cover plates to the earlier repair on the outside surface of the pipe. The welding procedures and the welders will be qualified using the guidance provided in ASME Code Case N-562. The licensee's alternative stated in its July 7, 1997, letter, provides that the plant operators visually monitor for changes to the pipe's condition once per shift during operator tours. Further, weekly monitoring (ultrasonic testing) of the degraded pipe will continue until test results show the test frequency can be changed or the Code repair is made. The maximum allowed frequency will be once every 3 months.

4.0 STAFF EVALUATION AND CONCLUSIONS

4.1 Operability Determination, Root Cause Analysis and Structural Integrity Evaluation

The licensee determined that a pipe spool located on the salt service water system greater erosion rate than the one previously projected. The spool condition was analyzed by the licensee and was found to be within the allowable stress limit of 18ksi. The licensee performed an operability determination of the salt service water system in the "as found" condition and the system was determined to be operable. The system was constructed in accordance with the requirements of ASME Code, Class 3.

The preliminary root cause of the piping degradation was attributed to delamination of aging rubber pipe lining due to localized high flow velocities resulting from throttling of the butterfly valve which is located immediately upstream. Rubber lined piping flaws experience accelerated erosion and corrosion where the rubber lining has delaminated. Where the lining remains intact, the pipe remains at its nominal full wall thickness. Hence, the wall erosion is local to the areas

where lining has delaminated. This conclusion was also confirmed by the results of the ultrasonic examination of five additional pipe locations which identified no other type of operationally caused defects. The licensee evaluated the structural integrity of the piping using the guidance of GL 90-05. Based upon the evaluation, it was determined that the integrity of the piping would be maintained and that the degraded piping satisfied the criteria of GL 90-05.

4.2 Augmented Inspection

To assess the overall degradation of the SSW system, augmented ultrasonic examinations were performed on five additional locations as described in the July 7, 1997, letter. The locations that were examined are similar locations of the other reactor building component cooling water and turbine building component cooling water heat exchanger outlet valves. All augmented inspection results at these locations found values greater than the manufacturers minimum pipe wall thickness.

4.3 Proposed Temporary Non-Code Repair and Monitoring Provisions

The licensee proposed a temporary Code repair to maintain the structural integrity of the piping until the piping could be replaced during an outage of sufficient duration. The licensee installed stainless steel cover plates to the pipe at the degraded locations as a temporary repair. The cover plate was ultrasonically examined periodically until the pipe was replaced. This is acceptable because the pressure at the repair location is low. It ranges from a slight vacuum to a slight positive pressure. In addition, plant operators visually monitored for any changes to the pipe once per shift during operator tours until permanent ASME Code repair was completed. Further, weekly monitoring (ultrasonic testing) of the degraded pipe was performed until the Code repair was made. The permanent Code repair was made during a forced outage that started on November 23, 1997.

4.4 Staff Conclusions

The staff has determined that the licensee's flaw evaluation is consistent with the guidelines and acceptance criteria of GL 90-05. In addition, the licensee had evaluated the temporary repair and determined that the SSW is operable. The staff, therefore, finds the licensee's structural integrity and operability assessments to be acceptable. The temporary Code repair consisted of welding stainless steel plates over the degraded area piping areas. The licensee accomplished a permanent Code repair of the degraded piping during the forced outage that started on November 23, 1997. During the period of plant operation until the permanent Code repair was accomplished, the repair area was monitored by plant personnel. Furthermore, the staff determined that performance of an immediate Code repair during plant operation was impractical since the repair would have necessitated the Unit to shutdown. The licensee's alternative program provided reasonable assurance of structural integrity. The staff, therefore, grants the request for relief, from performing the Code repair and imposed the licensee's alternative program pursuant to 10 CFR 50.55a(g)(6)(i) for the period of November 18 to 23, 1997. The relief granted is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest, giving due consideration to the burden upon the licensee and facility that could have resulted if the Code requirements were imposed on the facility.

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