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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF FROM ASME CODE MATERIALS

NORTHEAST UTILITIES

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 3

DOCKET NO. 50-423

1.0 INTRODUCTION

By letter dated December 18, 1991, Northeast Utilities (the licensee) requested relief from the requirements of the ASME Code Section XI in regards to the repair/replacement of a leaking expansion joint. The joint in question is located in an 8-inch service water line at the outlet from the Millstone Unit 3 "B" Emergency Diesel Generator (EDG) jacket water cooler.

The expansion joint bellows are fabricated from monel. Failure cause is attributed to crevice corrosion and/or microbiological initiated corrosion (MIC) resulting in one or more pits through the monel bellows. This is a plausible failure cause since the line conveys seawater and may experience low flow/no flow for significant time periods.

The licensee proposes to temporarily replace the leaking expansion joint with a reinforced rubber joint while a permanent replacement incorporating code acceptable material (Inconel 625 bellows) is procured.

Relief from the Code requirements was requested under the provisions of Generic Letter 90-05, "GUIDANCE FOR PERFORMING TEMPORARY NON-CODE REPAIR OF ASME CODE CLASS 1, 2, AND # PIPING." Since the component in question is not addressed within the bounds of Generic Letter 90-05, relief was not considered under those guidelines. However, the staff finds the licensee's analysis, based largely on considerations and methods contained within the Generic Letter, to be adequate and consistent with good engineering practice and acceptable for consideration under the provisions of 10 CFR 50.55a(a)(3).

2.0 DISCUSSION

Corrosion by sea water is an ongoing and significant cause of service water system problems throughout the industry. Frequently, the problem is rooted in incorrect materials choices made at the time of original design/construction. The staff recognizes that the ASME Code does not adequately address corrosion engineering principles in the design of power plants. Code materials are frequently not optimum or even appropriate choices from the corrosion resistance standpoint. The staff recognizes these limitations and is aware of

numerous alternative materials possessing superior sea water corrosion resistance combined with other desirable engineering properties.

However, because these materials are not included in the appropriate section(s) of the ASME Code, their use in safety related systems requires prior NRC review and approval pursuant to 10 CFR 50.55a(a)(3).

The licensee has proposed, as a temporary replacement, a reinforced rubber expansion joint. The joint is constructed of polyester and steel reinforced chlorobutyl rubber. Burst pressure is four times design pressure. Design pressure of the rubber joint is 150 psig versus 100 psig design pressure for the monel joint. Design temperature of the rubber joint is 250 degrees F, compared to 95 degrees F design/operating temperature for the monel bellows.

Sea water has no adverse effects on chlorobutyl rubber. Aging of the rubber occurs primarily as a result of time and temperature, in the absence of aggressive chemical agents. Aging results in a loss of elasticity with the gradual formation of a network of cracks. Failure is expected to be by leakage through the crack network. The reinforcing steel and polyester strands inhibit burst failures.

Seismic analysis of the service water system (performed by the licensee), incorporating the lower stiffness of the rubber joint (as compared to the monel joint) shows adequate system response.

The staff concludes that the engineering assessment and related industry experience gives reasonable assurance of the structural adequacy of the rubber joint to maintain pressure boundary integrity.

3.0 CONCLUSION

Consideration of the joint design parameters and the system interactions shows that the proposed substitution of the rubber expansion joint for the existing monel expansion joint will not endanger the public health and safety. Pursuant to 10 CFR 50.55a(a)(3), the staff finds the use of the rubber expansion joint in the Millstone Unit 3 service water system an acceptable alternative to an ASME code allowed bellows. Use of the rubber expansion joint shall be limited to a time period equal to the lesser of: (1) the Manufacturer minimum stated service life of 5 years, or (2) the time remaining in the current Unit 3, Code Section XI, ten year inservice inspection interval, currently given as 4 years, 4 months. After the shorter of these two intervals, the licensee shall replace the rubber expansion joint with a Code acceptable joint, or, apply to the NRC for approval for the installation of a new reinforced rubber expansion joint. Use of such a joint would be limited to an appropriate time period.

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Date: April 7, 1992