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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE INSERVICE INSPECTION PROGRAM

REQUEST FOR RELIEF FROM ASME CODE REPAIR REQUIREMENTS

FOR ASME CODE CLASS 3 PIPING

HOUSTON LIGHTING & POWER COMPANY

CITY PUBLIC SERVICE BOARD OF SAN ANTONIO

CENTRAL POWER AND LIGHT COMPANY

CITY OF AUSTIN, TEXAS

SOUTH TEXAS PROJECT UNITS 1 AND 2

DOCKET NOS. 50-498 AND 50-499

1.0 INTRODUCTION

10 CFR 50.55a(g) 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 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.

Technical Specification (TS) 4.0.5 says, in part, that inservice inspection of ASME Code Class 1, 2 and 3 components shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable Addenda as required by 10 CFR Part 50, Section 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR Part 50, Section 50.55a(g)(6)(i).

Alternatives to Code requirements may be used by nuclear licensees when authorized by the Commission 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 a licensee has 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 may grant such relief and may impose such alternative requirements as it determines 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 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 generic letter, 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 code repair necessitates a plant shutdown.

2.0 BACKGROUND

During routine system inspections, members of the Houston Lighting & Power Company's South Texas Project (the licensee) staff discovered flaws in the Essential Cooling Water System (ECWS) at the South Texas Project. The ECWS is a low pressure system with normal operating pressures of approximately 50 psig and the design pressure is 120 psig. The flaws are located in Unit 1 on 8 inch line EW-1186-WT3 and in Unit 2 on 8 inch line EW-2186-WT3. In both cases the flaws are located immediately above the weld joint in the cast material. Another flaw was found in Unit 2 on 6 inch line EW-2221-WT3 at field weld EW2221 FW0004. In all cases the flawed pipe material was identified to be cast aluminum-bronze (ASME SB 271 CA 952 material for the 8 inch cast flanges and ASME SB 148 CA 952 material for the 6 inch cast tee). The cast materials were welded with filler metal SFA 5.7 CuAl-A2 weld material. By letter dated May 31, 1996, the licensee requested relief from the ASME Code, Section XI repair or replacement requirements under the provisions of 10 CFR 50.55a(g). The licensee based its request for relief on the results of a flaw evaluation that was performed by the licensee in accordance with the guidelines and acceptance criteria contained in GL 90-05.

3.0 LICENSEE'S RELIEF REQUEST

3.1 Components for Which Relief is Requested

ASME Code Class 3 essential cooling water system piping (two eight inch cast pipe flanges and one six inch cast pipe tee).

3.2 Section XI Edition for South Texas Project, Units 1 and 2

1983 Edition including Summer 1983 Addenda of the ASME Code, Section XI.

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 serve 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 repair or replacement of two eight inch cast pipe flanges (Unit 1 ECW line 8"-EW-1186-WT3 and Unit 2 ECW line 8"-EW-2185-WT3) and one six inch cast pipe tee (Unit 2 ECW line 6"-EW-2221-WT3) per the requirements of Article IWA-4000 or IWA-7000, respectively. Relief is being sought until the next South Texas, Units 1 and 2, scheduled outage for the affected unit. At that time, the licensee will perform a Code repair to return the system to compliance with the Code.

3.5 Basis for Relief

Request for relief has been submitted under the impracticality provisions of 10 CFR 50.55a(g). The licensee stated that performance of a Code repair during power operations within the time permitted by the TS limiting condition for operation may not be practical due to potential for fit-up problems during repair, potential need for access to the inside surface, and extended time required for draining.

The licensee has analyzed the effect of through-wall flaws in ECWS piping and found that the pipe degradation is slow and, therefore, rapid or catastrophic failure is not a consideration. Further, the licensee has also determined that the leakage can be detected before flaw reaches a limiting size that would affect the operability of the ECWS (currently there is no measurable leakage). Also because there is no measurable leak there is no adverse effect on any safety-related equipment in the surrounding area.

3.6 Licensee's Alternative Program

1. Visual inspection of the affected areas to detect possible leakage will be performed weekly. Operators will be able to identify any significant leakage during normal rounds.

2. The integrity of the piping will be assessed every month until a permanent repair can be completed. Radiographs or ultrasonic examination will be performed of the degraded areas every month to assess the piping.

3. Performance of an engineering evaluation of the structural integrity of the system based on the results of the visual, radiographic and/or ultrasonic examinations.

4. Continuation of the ECWS monthly walkdowns. This walkdown is a regularly scheduled VT-2 examination of the ECWS and includes all cast components.

5. Performing a Code repair during the next refueling outage for the affected unit.

4.0 STAFF EVALUATION AND CONCLUSIONS

4.1 Operability Determination, Root Cause Analysis and Structural Integrity Evaluation

The licensee determined that the flaws were located in the ECWS which is classified as ASME Code Class 3 system. The flaws are located in Unit 1 on 8 inch line EW-1186-WT3 and in Unit 2 on 8 inch line EW-2186-WT3 and 6 inch line EW-2221-WT3. In all cases the flawed pipe material was identified to be cast aluminum-bronze which is inherently ductile material (ASME SB 271 CA 952 material for the 8 inch cast flanges and ASME SB 148 CA 952 material for the 6 inch cast tee). Upon discovery of the flaws, the licensee performed an evaluation of the flaws using the guidance provided in GL 90-05 and found that the flaws satisfy the through-wall criteria prescribed in GL 90-05 and that the flaws meet the criteria for a non-Code repair. The licensee determined that the operability of the system will not be impaired because currently there is no measurable leak. Also because currently there is no measurable leak there will be no adverse effect on any other safety-related equipment in the surrounding area.

The licensee performed a root cause analysis of the flaw, and determined that the degradation resulted from dealloying. The licensee believes that a preexisting flaw was present to enable initiation of the dealloying process. The dealloying process normally initiates from a crevice such as a backing ring, a fabrication-induced flaw, or a casting flaw. A dealloying area may include cracks as those identified on the 8 inch flanges. Failure analysis indicates that the crack propagation occurred by a process of dealloying along the crack front. Previous examples of such cracks were found to have initiated from pre-existing flaws exposed to the ECWS cooling water. The problem of dealloying of castings has been also described in previous communications with the NRC. The flaws were inspected using visual and radiographic examinations to assess overall degradation of the affected castings. The examination of the flaw areas indicated that the flaw in Unit 1, 8 inch cast flange measured 4-1/16 inches and the flaw in Unit 2,

8 inch flange measured 3-1/16 inches. The radiographic examination of the Unit 2, 6 inch tee to flange joint found no linear indications. An evaluation of the ultrasonic and radiographic examination results and calculation of structural integrity confirmed that the flawed piping satisfies the "through-wall flaw" approach described in NRC GL 90-05.

4.2 Augmented Inspection

The flaws are located in two 8 inch pipe flanges and one 6 inch pipe tee weld joint. The flaw areas were visually and radiographically examined to assess the flaws. No further areas of degradation were observed and the flaws were determined to be localized and caused by dealloying. Previous cases of dealloying has been described in previous communications with the NRC staff. The ECWS will be visually inspected monthly for leaks or indications of dealloying including all castings.

4.3 Proposed Temporary Noncode Repair and Monitoring Provisions

At this time, the licensee is monitoring the flawed areas every week. If measurable leak is identified quantitative assessment of the leak will be performed. The licensee has committed to perform ultrasonic or radiographic examination of the flawed area every month to assess the castings wall degradation rate. Based on the results of the examinations, an engineering evaluation will be performed to determine if further remedial measures or corrective actions are needed until Code repair is completed.

4.4 Staff Conclusions

The staff has determined that the licensee's flaw evaluation has been consistent with the guidelines and acceptance criteria of GL 90-05. The staff, therefore, finds the licensees' structural integrity and operability assessments to be acceptable. The licensee has established a periodic inspection program to monitor flaw growth and ensure continued operability. The licensee is also monitoring the condition of the flaws by visual inspection every week to ascertain that no measurable leak exist of the flawed areas. If measurable leak is identified quantitative assessment of the leak will be performed. The licensees actions constitute an acceptable temporary alternative to the Code requirements.

Furthermore, the staff finds that performance of an immediate Code repair is impractical since it would require an isolation of the affected ECWS piping and a plant shutdown, since performance of a Code repair would take longer than allowed by the limiting condition for operation. This meets the GL 90-05 definition of impracticality. Such an isolation is not in the best interest of plant safety, given the magnitude of the flaw and the licensee's alternative program. The staff, therefore, concludes that the licensee's proposed alternative 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 that could result if the Code requirements were imposed on the facility. Pursuant to 10 CFR 50.55a(g)(6)(i) the alternative is imposed until the next scheduled outage exceeding 30 days, but no later than the next refueling outage, for the affected unit. At that time a Code repair will be performed.

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