Florida Power
CORPORATION
Crystal River Unit 3
Docket No. 50-302

January 15, 1992
3F0192-04

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: Actions to Contain Minor Leaks in Moderate Energy Piping Systems

References: A. Generic Letter 90-05

B. NRC internal guidance letter dated August 16, 1990

Dear Sir:

Florida Power Corporation (FPC) has reviewed the guidance provided in references A and B regarding temporary non-code repairs of Class 3 moderate energy piping systems. Reference A defined the NRC staff criteria for considering relief requests for temporary non-code repairs. Reference B clarified the stopgap measures that could be taken to contain a leak while going through the process of obtaining NRC advance approval of the temporary repair. Neither reference fully addresses containing the leak until a code repair can be performed.

Based on the guidance of references A and B, FPC is notifying the NRC of actions that were taken to contain a minor leak discovered in a Code Class 3 moderate energy piping system. The leak was discovered in Summer 1991 prior to the Fall 1991 Mid-Cycle Outage. The actions taken were to contain the leak until a code repair could be performed in the Mid-Cycle Outage. The following sections provide pertinent information associated with this situation. Background, with a general description of the piping system involved, description of the stopgap measure employed, flaw detection and impracticality determination, root cause and flaw characterization, flaw evaluation and structural integrity assessment, augmented inspections, and future plans with a description of how such occurrences will be dealt with in the future.

BACKGROUND:

The Nuclear Services Raw Water (RW) System serves as the ultimate heat sink for cooling plant equipment. The RW system is a moderate energy system since the maximum operating temperature is less than 200 °F and the maximum operating pressure is less than 275 pounds per square inch gravity (psig). The entire RW piping system including the flawed two inch spool piece is coated with urethane for corrosion protection.

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FLAW DETECTION AND IMPRACTICALITY DETERMINATION:

During a routine walkdown, a leak was detected in the two inch spool piece (two inch diameter, Schedule 40 carbon steel pipe welded to the side of the 20 inch diameter RW discharge piping). Upon visual examination it was determined that the pipe had a through-wall pin-hole flaw. Performance of a code repair was considered impractical because of time constraints. To perform such a repair, the entire spool piece would need to be removed and replaced. Welding a new spool piece to the main 20 inch pipe would result in localized heating around the weld. This heating would damage the bond of the urethane lining to the pipe which would also need to be repaired.

DESCRIPTION OF THE STOPGAP MEASURE EMPLOYED:

The stopgap measure consisted of a 1/8 inch thick neoprene gasket with a small amount of room temperature vulcanized rubber, held in place by a two-and-a-half inch diameter stainless steel hose clamp. This interim measure was used to stop the loss of inventory and prevent spraying of seawater onto nearby equipment. However, this was a reversible measure and did not affect the structural integrity of the pipe. The stopgap measure remained in place until the beginning of the Mid-Cycle Outage when the spool piece was replaced, approximately two months.

ROOT CAUSE AND FLAW CHARACTERIZATION:

Ultrasonic Testing (UT) results indicated that the flaw was restricted to the site of the leak. The flaw was a through-wall leak about 5/16 of one inch diameter. The flaw was apparently caused by a localized failure of the urethane lining on the inside of the pipe. Such lining failures allow stagnant saltwater to attack the unprotected carbon steel resulting in localized corrosion, ultimately leading to through-wall failure.

FLAW EVALUATION AND STRUCTURAL INTEGRITY ASSESSMENT:

The UT examination results showed that it was a single localized flaw. The pipe wall thickness, away from the flaw, around the circumference and along the center line of the pipe was within the nominal manufactured wall thickness (.135 inches) of a two inch Schedule 40 pipe. UT was performed in five other areas, and no indication of corrosion was found.

FPC performed an analysis of the flawed piping using the "Through-Wall Flaw" approach. The stress evaluation included the effects of pressure, deadweight, and seismic loads. The effects of thermal stresses were considered insignificant because the assembly cantilevers off the riser and is unrestrained in the vertical and horizontal directions. The design pressure was applied to the piping assembly. The weight of the assembly was applied to the end of the cantilever as a concentrated load. This load was increased to account for the effects of the seismic accelerations. This approach generated a maximum stress of 2922 psi. This calculated stress shows that sufficient section modulus existed in the pipe to resist the loadings due to pressure, deadweight, and seismic accelerations without exceeding the code (USAS B31.1, 1967 Edition) allowable of 15,000 psi. The stress intensity factor K calculated using formula 1 of Reference A was 4.9, this was less than the 35 allowable used in the generic letter for ferritic steel. Therefore, the flawed piping met the structural integrity criteria given in Generic Letter 90-05.

AUGMENTED INSPECTION:

A temporary surveillance plan was generated to assure a weekly walk-through was performed. This plan qualitatively assessed any leakage through the temporary non-code repair. Additional Non-destructive examination (NDE)/UT of the pin-hole area was to be performed on a three month interval. However, the spool piece was replaced at the beginning of the Mid-Cycle Outage (approximately within two months). At this time, it was verified that the urethane lining on the inside of the spool piece was neither of the required thickness nor was the inside of the two inch spool piece completely coated. Due to pinholes in the urethane coating, adequate protection of the carbon steel spool piece was not provided. FPC considered it prudent to visually inspect other locations where similar components were in place. That investigation showed that the lining was also inadequately applied at several of these locations, however, the extent of corrosion found was limited to pinhole craters of less than 25 mils depth. Nevertheless, FPC replaced all but three of the problem spool pieces in the RW system. These three spool pieces are scheduled for modification and replacement during Refuel 8 which is scheduled to start in April 1992. While awaiting for their replacement and to assess any possible leakage monthly walk-downs have been scheduled.

FUTURE PLANS:

FPC is considering a revision to CR-3's Repair and Replacement Program to reflect the guidance contained in the references. This revision would document FPC's intent to employ appropriate stopgap measures without seeking relief for minor leaks. Formal relief will be sought only in those cases when a code repair would not be performed at the next appropriate opportunity.

FPC considers the guidance provided in Reference 6 to be significant and suggests that supplementing Generic Letter 90-05 to include such information is appropriate. FPC does not agree with the backfit analysis provided with the generic letter. The failure to consider tacit approval renders the analysis incomplete. The consideration of all corrective actions to be "repairs" subject to the provisions of 10 CFR 50.55a(g) is certainly a very broad interpretation. FPC suggests a narrower interpretation is more consistent with the NRC staff's actual past practices.

Sincerely,

P. M. Beard, Jr.
Senior Vice President
Nuclear Operations

PMB:LVC

cc: Regional Administrator, Region II
NRR Project Manager
Senior Resident Inspector