December 6, 2005

Mr. J. A. Stall
Senior Vice President, Nuclear and
Chief Nuclear Officer
Florida Power and Light Company
P.O. Box 14000
Juno Beach, Florida 33408-0420

SUBJECT: TURKEY POINT NUCLEAR PLANT, UNIT 3 - SAFETY EVALUATION OF RELIEF REQUEST FOR TEMPORARY NONCODE REPAIR OF SPENT FUEL POOL COOLING LINE (TAC NO. MC8590)

Dear Mr. Stall:

By a letter dated September 23, 2005, Florida Power and Light Company (the licensee) requested approval to deviate from the requirements of the American Society of Mechanical Engineers (ASME) Code, Section XI, Article IWA-4000 at Turkey Point Unit 3. Pursuant to Title 10 of the *Code Federal Regulation*s (10 CFR), Section 50.55a(a)(3)(ii), the licensee proposed to use a noncode repair to limit leakage prior to performing a permanent repair and as a contingency to allow restoration of the spent fuel pool cooling system in the event that a permanent repair cannot be completed within the projected time frame.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's proposed alternative and has concluded that the licensee has provided an acceptable stand-by alternative to the requirements of ASME Code, Section XI. Furthermore, the staff finds that imposing an ASME Code repair without approving the temporary noncode repair contingency would constitute an undue burden (create undue hardship) upon the licensee without a compensating increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii) the proposed alternative is authorized for Turkey Point, Unit 3 until the next scheduled outage exceeding 30 days, but not beyond the next refueling outage currently scheduled for March 2006.

Further details on the bases for the NRC staff's conclusions are contained in the enclosed safety evaluation. If you have any questions regarding this issue, please feel free to contact Brendan Moroney at (301) 415-3974.

Sincerely,

/RA by EBrown for/
Michael L. Marshall, Jr., Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-250

Enclosure: Safety Evaluation

cc: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TEMPORARY NONCODE REPAIR

FLORIDA POWER AND LIGHT COMPANY

TURKEY POINT NUCLEAR PLANT, UNIT 3

DOCKET NO. 50-250

1.0 INTRODUCTION

By letter dated September 23, 2005, Florida Power & Light Company (FPL, the licensee) requested, pursuant to Title 10 of the *Code Federal Regulation*s (10 CFR), Section 50.55a(a)(3)(ii), approval to perform a temporary noncode repair on a spent fuel pool (SFP) cooling system line at its Turkey Point Unit 3 Nuclear Plant. The relief request was made because the proposed temporary noncode repair deviates from the requirements of American Society for Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, Article IWA-4000. Specifically, the licensee is preparing to perform a permanent ASME Code repair. However, until the repair is made, FPL would like to install a temporary noncode repair to limit leakage from the line. In addition, since the SFP cooling system is not redundant, the licensee is proposing to employ the same temporary noncode repair if the permanent repair cannot be completed within the projected time frame when the permanent repair is implemented. The noncode repair will reduce the housekeeping burden due to leakage and then, if necessary, allow restoration of the SFP cooling system in order that pool temperatures do not rise excessively if the permanent repair cannot be completed during the initial repair attempt.

ASME Code, Section XI, 1998 Edition through 2000 Addenda is used for the Repair and Replacement program activities for the fourth 10-year Inservice Inspection (ISI) Interval at Turkey Point Unit 3.

2.0 REGULATORY EVALUATION

Pursuant to10 CFR 50.55a(g), ISI of nuclear power plant components shall be performed in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, except where specific written relief has been granted by the U.S. Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 50.55a(g)(6)(i). It is stated in 10 CFR 50.55a(a)(3) that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Enclosure

Further, 10 CFR 50.55a(g)(5)(iii) states that if the licensee has determined that conformance with certain code requirements is impractical for its facility, the licensee shall notify the Commission and submit information to support the determinations. The information provided by the licensee in support of the request has been evaluated by the NRC staff and the bases for disposition are documented below.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Request and Evaluation

3.1.1 ASME Code Component Affected

The affected pipe section is at the discharge of the SFP cooling system heat exchanger to the Unit 3 SFP. The pipe is 8-inch seamless fabricated from ASTM A 312, Type 304 Stainless Steel, Schedule 10S. The design code of record is American National Standards Institute B31.1, Code Class 3. Design temperature and pressure: 212 ^{0}F and 150 psig.

3.1.2 Applicable Code Edition and Addenda

ASME Code, Section XI, 1998 through 2000 Addenda.

3.1.3 Applicable Code Requirement for Which a Deviation is Requested

ASME Code, Section XI, Article IWA-4000. Section XI of the ASME Code specifies repair methods for flaws that exceed Code-acceptable limits in piping that is in service. A Code repair is required to restore the structural integrity of the flawed piping, independent of the operational mode of the plant when the flaw is detected.

3.1.4 Reason for Request

Flaw Detection and Hardship Determination

On April 19, 2005, a through-wall flaw was detected in a Unit 3 SFP cooling system line. Leakage from the flaw was approximately 6 cubic centimeters per minute (cc/min) at the time of discovery. The leak rate is gradually increasing. FPL employed ASME Code Case N-513, as approved by the NRC in Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," and cited in 10 CFR 50.55a(b)(2)(xiii)(A), to evaluate the acceptability of the flaw for continued service until a repair could be made.

FPL intends to perform a permanent Code repair to the affected section of the leaking SFP cooling system line. FPL intends to employ the temporary noncode repair to minimize leakage until the permanent repair is made. During the implementation of the permanent repair, in the event the repair cannot be completed in the time available, FPL would continue to employ the temporary noncode repair so that the SFP cooling system could be returned to operation. The Unit 3 SFP cooling system is not redundant. It must be removed from service in order to drain the leaking portion of the discharge line to perform a permanent repair. The limited amount of time available to complete the repair is judged to be adequate; however, FPL considers the continued use of the temporary noncode repair, as a contingency, to be a prudent compensatory measure to ensure continued cooling of the Unit 3 SFP. The noncode repair

consists of a mechanical gasketed clamp that is designed for the service conditions of the piping system. The evaluation of a bounding flaw with the clamp in place assures the structural integrity of the pipe until the permanent repair is complete. Since this type of repair is not allowed by the ASME Code, FPL requests permission to deviate from the Code. The temporary noncode repair will be employed until the permanent repair is made and will continue to be used in the event the permanent repair cannot be completed in time during the initial repair attempt.

FPL will continue daily visual inspections to monitor any leakage from the temporary repair until the permanent repair is completed.

Until the permanent repair is made, the temporary noncode repair will minimize leakage and reduce the housekeeping burden. The inability to employ the temporary noncode repair creates a hardship without a compensating increase in the level of quality or safety in that additional worker dose is necessary to address housekeeping needs due to leakage. In addition, the continued use of the noncode repair will allow restoration of the SFP cooling system in order that pool temperatures do not rise excessively. If the permanent repair could not be completed in time to avoid excessive pool temperature, then compliance with the Code would create a hardship without a compensating increase in the level of quality or safety in that the SFP water temperature could increase to the point of boiling without cooling. In December 2005, the estimated time for the SFP water to reach boiling is 67 hours and the estimated time for the pool water to reach the administrative limit of 170 ^{0}F is 40 hours. The estimates of the time to perform the various Code repairs vary from 20 to 40 hours.

Root Cause Determination and Flaw Characterization

The licensee provided the following information:

- The Unit 3 Spent Fuel Pit heat exchanger room is located at elevation 18 feet and the main entrance door for this room is made of grating steel that exposes the piping within the room to moisture and salt-laden corrosive outdoor environment.

- The flaw in the stainless steel 8-inch pipe is pinhole size (approximately 1/64-inch diameter) and located at the bottom side of the pipe.

- The flaw is local in extent (i.e., not circumferential) and is outside diameter (OD)-initiated.

- The flaw is located ½ inch downstream from the flange butt weld for valve 3-820, the SFP heat exchanger outlet valve.

- Leakage volume was minimal at discovery (approximately 6 cc/min).

Based on the above, the cause of pipe wall degradation is judged to be chloride-induced OD-initiated stress corrosion cracking (SCC). The flaw initiated from the base of the pit that formed on the OD surface of the pipe (pitting is commonly associated with the SCC phenomena).

FPL has performed nondestructive examinations (NDEs) in accordance with ASME Code Case N-513 and is monitoring leak rate daily. Visual inspection and dye-penetrant examination

in the area of the flaw did not detect additional flaws or general wastage. The flaw remains bounded by the flaw evaluation discussed below.

Potential Repair-Induced Flaw

FPL's repair process is designed to ensure that a reliable permanent Code repair is achieved. However, there is a remote possibility that performing the branch connection repair method might result in burn-through of the thin-wall Schedule 10S pipe during the welding process.

In order to provide a contingency should this occur with the need to restore operation of the SFP cooling system, FPL has evaluated a bounding case for a potential burn-through. Since guidance for evaluation of non-planar through-wall flaws is not provided in Code Case N-513, an alternate wall thinning criteria was developed using the "Limits of Reinforcement" rules in Paragraph NB-3640 of the ASME Code, 1989 Edition.

Flaw Evaluation

A flaw evaluation was performed in accordance with ASME Code Case N-513. The evaluation used the "through-wall flaw" approach and assumed the pinhole leak to have a planar flaw length of 0.25 inch in the axial or circumferential direction. The analysis yielded an allowable flaw size of 4.93 inches in the axial direction and 14.86 inches in the circumferential direction. Flaw growth to the next refueling outage in March 2006 is predicted as negligible in both the axial and circumferential directions. Therefore, there is adequate margin to the allowable flaw size.

Burn-Through During Repair

An approach using "Limits of Reinforcement" described in the ASME Code Section III was used to approximate an allowable through-wall hole diameter. Through-wall pit sizes up to approximately 3.65 inches in diameter can be tolerated for a nominal pipe thickness of 0.148 inch without exceeding ASME Code margins. This is much greater than the assumed pinhole flaw size and bounds the flaw size of a potential burn-through for the installation of a 2-inch diameter branch connection. Flaw growth to the next refueling outage in March 2006 with a larger initial flaw size of 3.65 inches is predicted as negligible in both the axial and circumferential directions.

The area around the burn-through hole will be examined to verify adequate wall thickness and be properly prepared prior to installation of the temporary noncode repair.

3.1.5 Duration of Proposed Alternative

The permanent repair will be completed no later than the next Unit 3 refueling outage, currently scheduled for March 2006.

3.2 Staff Evaluation

The licensee stated that it is preparing to perform a permanent ASME Code repair of the pinhole leak, however, until the repair is made, FPL would like to install a temporary noncode repair to limit leakage from the line. Further, because the SFP cooling system is not redundant, the licensee is proposing to employ the same temporary noncode repair if the permanent repair cannot be completed within the allocated time. The licensee is considering one of the following three Code repair options with Option 1 being the preferred option.

Option 1 is to add a 2-inch diameter welded branch connection at the through-wall pinhole leak. The branch connection with a welded plug will act as the new pressure boundary at the attachment profile. All selected materials are compatible with SFP cooling system class and service. The time estimate for completion of this repair option is 20 hours.

Option 2 is the installation of a pipe spool piece to replace the affected portion of the 8-inch diameter piping. The spool piece will be shop prepared. This replacement section of pipe will be presized and will be designed to minimize required field welding (one slip-on flange). All selected materials are designed to be compatible with SFP cooling system class and service. The time estimate for completion of this repair option is 40 hours.

Option 3 is a gas tungsten arc (GTAW) open root weld repair at through-wall holes on thin-wall pipe. The GTAW process uses an open root technique with a maximum root opening of 5/32 inch for an open root butt joint with no limitation on the length of the grind-out. This repair method is also appropriate, if conditions warrant, to be performed on the existing through-wall pinhole location with proper pipe prep-work, or may be performed following a pipe wall burn-through created during welding. The time estimate for completion of this repair option is 20 hours.

NDE, as specified by the ASME Code, will be performed during any of the repairs described above.

The NRC staff finds all of the above proposed options acceptable because all options meet the requirements of ASME Code, Section XI. Compliance with the requirements of ASME Code Section XI provides an acceptable level of quality and safety.

The licensee has selected to use a pipe clamp designed to fit over a through-wall hole for the temporary noncode repair and noncode repair contingency. The pipe clamp is made of commercial grade materials able to withstand expected operating pressure and temperature conditions should a burn-through be created on the Schedule 10S 8-inch diameter stainless steel pipe during welding for the Code repair activity. According to the licensee, the clamp and bolting material is robust and able to withstand any anticipated operating condition. Also, between the clamp and pipe material, the licensee would be using 1/8-inch thick neoprene rubber gasket material to assure that the leak is stopped. The NRC staff finds the proposed temporary noncode repair method using clamp and neoprene rubber acceptable because the clamp and bolting material is designed to withstand any anticipated operating condition and because the leak would be stopped using neoprene rubber gasket. Maintaining the flawed SFP line within the designed operating conditions would ensure that the SFP line performs as designed.

The licensee has also performed a prerepair visual assessment and liquid penetrant testing (PT) of the flawed area of pipe. PT has characterized the flaw as a pinhole size, rounded indication less than 1/32 inch in diameter, that is located approximately 1/2 inch from the weld toe in the weld's heat affected zone. This indication is located at the bottom of the horizontal run pipe. Augmented inspection in accordance with ASME Code Case N-513 was performed. and no additional flaws were found. Based on the results of its evaluation, the licensee concluded that the cause of pipe wall degradation is chloride-induced OD-initiated SCC. The flaw initiated from the base of the pit that formed on the OD surface of the pipe caused by outside contaminates. Because the pipe material is austenitic stainless steel and because the flaw was caused by outside initiated stress corrosion cracking the flawed area is not expected to enlarge significantly.

The licensee has also performed flaw evaluation of the through-wall flaw in accordance with the procedures specified in the NRC approved Code Case N-513. The evaluation used the "through-wall flaw" approach and assumed the pinhole leak to have a planar flaw length of 0.25 inch in the axial or circumferential direction. The analysis yielded an allowable flaw size of 4.93 inches in the axial direction and 14.86 inches in the circumferential direction. Flaw growth to the next refueling outage in March 2006 is predicted to be negligible in both the axial and circumferential directions. Therefore, the safe operation of the SFP line is ensured until the next refueling outage in March 2006.

Because the SFP through-wall flaw is not considered a planar flaw, guidance for evaluation of non-planar through-wall flaws is not provided in Code Case N-513. The licensee has developed an alternate wall thinning criteria using the "Limits of Reinforcement" rules specified in Paragraph NB-3640 of the ASME Code, Section III to approximate an allowable through-wall hole diameter. The evaluation results indicated that through-wall pit sizes up to approximately 3.65 inches in diameter can be tolerated for a nominal pipe thickness of 0.148 inch without exceeding ASME Code, Section III margins. This is much greater than the assumed pinhole flaw size and bounds the flaw size of a potential burn-through for the installation of a 2-inch diameter branch connection.

The licensee also stated that until the permanent repair is made, the temporary noncode repair will minimize leakage and reduce the housekeeping burden. The inability to employ the temporary noncode repair creates a hardship without a compensating increase in the level of quality or safety because additional worker dose is necessary to address housekeeping needs due to leakage. Further, the continued use of the noncode repair will allow restoration of the SFP cooling system so that pool temperatures do not rise excessively. If the permanent repair cannot be completed in time, the water temperature of the SFP will increase significantly. This would create a hardship upon the licensee without a compensating increase in the level of quality or safety because the licensee would need to undertake mitigative actions to reduce the water temperature of the SFP to within design levels. Therefore, the staff finds that requiring the licensee to perform a permanent ASME Code repair without approving the temporary noncode repair and noncode repair contingency would result in hardship because the SFP cooling system is not redundant and the SFP water temperature could increase to the point of boiling. Placing the SFP in such state is not in the public interest and safety taking into consideration the temporary alternative that the licensee has proposed.

4.0 CONCLUSION

Based on the information provided in the licensee's submittal, the NRC staff concludes that the licensee has provided an acceptable stand-by alternative to the requirements of ASME Code, Section XI. Furthermore, the staff finds that imposing an ASME Code repair without approving the temporary noncode repair contingency would constitute an undue burden (create undue hardship) upon the licensee without a compensating increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii) the proposed alternative is authorized for Turkey Point, Unit 3 until the next scheduled outage exceeding 30 days, but not beyond the next refueling outage, currently scheduled for March 2006, at which time a Code repair will be performed.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: George Georgiev

Date: December 6, 2005

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