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

January 4, 2018

Mr. Mano Nazar
President and Chief Nuclear Officer
Nuclear Division
Florida Power & Light Company
Mail Stop: EX/JB
700 Universe Blvd.
Juno Beach, FL 33408

SUBJECT: ST. LUCIE PLANT, UNIT NO. 1 – RELIEF FROM THE REQUIREMENTS OF THE ASME CODE RE: RELIEF REQUEST NO. 3 FOR THE FIFTH 10-YEAR INSERVICE INSPECTION INTERVAL (CAC NO. MF9288; EPID L-2017-LLR-0003)

Dear Mr. Nazar:

By letter dated February 16, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17047A283), as supplemented by letter dated September 13, 2017 (ADAMS Accession No. ML17256A176), Florida Power & Light Company (FPL) requested an alternative to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," Subsection IWA-4000, for defect removal prior to repair at the St. Lucie Plant, Unit No. 1.

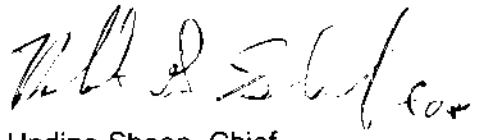
Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(2), FPL proposed an alternative that permits defects in intake cooling piping to remain in place and utilizes bolted patch plates for repair of degraded areas.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that FPL has addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2) and that compliance with IWA-4000 would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety over the proposed alternative. Therefore, pursuant to 10 CFR 50.55a(z)(2), the NRC authorizes the use of Relief Request No. 3 at the St. Lucie Plant, Unit No.1, for the fifth 10-year inservice inspection interval, which is scheduled to begin February 11, 2018, and end on February 10, 2028.

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

If you have any questions, please contact the Project Manager, Perry H. Buckberg, at 301-415-1383 or Perry.Buckberg@nrc.gov.

Sincerely,



Undine Shoop, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-335

Enclosure:
Safety Evaluation

cc w/Enclosure: Distribution via Listserv

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# SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

# RELIEF REQUEST NO. 3 REGARDING

# ALTERNATE REPAIR FOR INTAKE COOLING PIPING

# FLORIDA POWER & LIGHT COMPANY

# ST. LUCIE PLANT, UNIT NO. 1

# DOCKET NO. 50-335

## 1.0 INTRODUCTION

By letter dated February 16, 2017 (Reference 1), as supplemented by letter dated September 13, 2017 (Reference 2), Florida Power & Light Company (the licensee) submitted Relief Request (RR) No. 3 to propose an alternative to the requirements of Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Subsection IWA-4000, regarding the repair of intake cooling water (ICW) piping at the St. Lucie Plant, Unit No. 1 (St. Lucie Unit 1).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(2), the licensee requested the U.S. Nuclear Regulatory Commission (NRC) to review and approve the use of a proposed alternative on the basis that the IWA-4000 method of piping defect removal prior to repair results in hardship and unusual difficulty without a compensating increase in the level of quality and safety. The proposed alternative would permit piping defects to remain in place and utilizes bolted patch plates for repair of degraded areas.

## 2.0 REGULATORY EVALUATION

Adherence to Section XI of the ASME Code is mandated by 10 CFR 50.55a(g)(4), which states, in part, that ASME Code Class 1, 2, and 3 components (including supports) will meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI.

The regulation in 10 CFR 50.55a(z) states, in part, that alternatives to the requirements of paragraph (g) of 10 CFR 50.55a may be used when authorized by the NRC if the licensee demonstrates that (1) the proposed alternative provides an acceptable level of quality and safety, or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request the use of an alternative and the NRC to authorize the proposed alternative.

## 3.0 TECHNICAL EVALUATION

### 3.1 Relief Request No. 3

#### 3.1.1 Component Identification

The affected components are ASME Class 3 ICW system 30-inch diameter piping, System 21, 1-30"-CW-29 and 1-30"-CW-30 (discharge piping downstream of component cooling water heat exchangers only).

#### 3.1.2 Applicable Code Edition

The licensee stated that the code of record for the fifth 10-year inservice inspection (ISI) interval (fifth interval) is the ASME Code, Section XI, 2007 Edition with Addenda through 2008. The USAS B31.7 Class 3, 1969 edition is the Construction Code for St. Lucie Unit 1. The ASME Code, Section III, Class 3, 1971 edition with addenda through summer 1973, is the code of record for St. Lucie Unit 1 based on reconciliation with the Construction Code.

#### 3.1.3 Applicable Code Requirement

The ASME Code, Section XI, paragraph IWA-4421, of the 2007 Edition with Addenda through 2008 requires that defects shall be removed or mitigated in accordance with IWA-4422.1, which requires that a defect is considered removed when it has been reduced to an acceptable size.

#### 3.1.4 Background

The licensee stated that the safety-related ICW system is comprised of two redundant trains, train A (1-30"-CW-30) and train B (1-30"-CW-29). These lines are open-ended discharge pipes to the ocean discharge canals. The nominal pipe size is 30 inches with a wall thickness of 0.375 inches and is made of A-155 KC-65 (equivalent to SA 106 Grade B) carbon steel. The buried ICW piping has a 0.125-inch thick internal liner of cement or epoxy to preclude the loss of internal pipe wall due to corrosion from seawater. The outer surface of the piping is coated with coal-tar epoxy. The ICW piping is qualified in accordance with ASME Code, Section III, Subsection ND, criteria. Burial depths range from 4 feet 3 inches to 16 feet below grade.

The licensee performs single train internal pipe inspections each refueling outage, resulting in 100-percent inspection every other outage. The licensee inspects the subject piping in accordance with NRC Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment." The routine inspection ensures that corrosion, erosion, protective coating failure, silting, and bio fouling do not degrade the performance of the ICW piping. The licensee drains the pipe, removes a section to allow internal access, cleans the pipe surface, and visually examines the cement or epoxy liner. The licensee observes for signs of corrosion deposits, staining, cracks, missing lining, area blisters, peeling/delamination, surface irregularities, or discoloration. If degradation is observed on pipe base metal, the licensee uses ultrasonic testing to measure wall thickness. Once the wall thickness corrodes to

become thinner than the ASME Code-required minimum thickness or a through-wall leak is identified, the licensee is required to either repair or replace the pipe in accordance with the ASME Code, Section XI, Article IWA-4000.

The licensee stated that performing repairs on areas with local thinning or areas that contain through-wall leaks in accordance with IWA-4000 could result in damage to the external pipe coating. A traditional repair of cutting a hole and installing a welded rolled plate is not possible because the pipe is buried and the outside is not easily accessible. The licensee stated that compliance with the requirements of ASME Code, Section XI, Subsection IWA-4000, for defect removal prior to repair would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, the licensee proposed its alternative pursuant to 10 CFR 50.55a(z)(2).

3.1.5 Proposed Alternative and Basis for Use

In lieu of the repair or replacement in accordance with ASME Code requirements, the licensee proposed to install internal bolted patch plates to cover the damaged areas of the inside surface of the pipe. The licensee stated that the internal bolted patch plates are designed to meet the criteria of the applicable code of record, as required by ASME Code, Section XI, IWA-4221.

The licensee has installed several bolted patch plates at St. Lucie Unit 1 and is requesting relief to leave the existing bolted plates in place and to allow installation of additional bolted plates in the future to repair similarly damaged areas. The licensee stated that periodic inspections completed to date have not identified any degradation of the existing internal bolted plate repairs.

The licensee determined the minimum pipe wall thickness using design formulas of ASME Code, Section III, and the criteria presented within Final Safety Analysis Report Table 3.9-3 for pressure stress and longitudinal bending stresses.

Before installing the bolted plate, the licensee blast cleans the defective area/corrosion holes and fills the area with epoxy material to the profile of the pipe inside diameter. A section of the pipe lining centered on the affected area is then removed. The licensee marks the bolt hole locations on pipe and ultrasonically inspects the pipe wall thickness in the degraded area to ensure that all readings outside of the areas of degradation are within the manufacturer's tolerance of nominal wall thickness. The licensee drills and taps 1/4-inch deep bolt holes into the inside surface of the pipe. The licensee installs studs and applies epoxy to pipe beneath the closure plate area, including previously filled corrosion holes and the gasket area. The gasket, closure plate, washers, and nuts are installed before the epoxy hardens. The entire repair area is covered with epoxy coating, and the coating is blended to provide smooth transitions to minimize flow turbulence.

After the bolted plate is installed as described, the licensee performs a visual inspection and a hammer test to determine acceptable bonding. If a patch is suspect based on visual examination or hammer test results, the patch is removed from the pipe surface for further examination.

The licensee stated that because the bolted patch plate is installed on the inside surface of the piping and it completely covers the damaged area with a gasket and plate, the damaged area is isolated from the corrosive environment. Also, the damaged area is covered with an epoxy

coating prior to installing the plate and after the plate is installed, further isolating the degraded area from the corrosion surface. The licensee noted that there is minimal potential for the degraded area to expand over time during service. The licensee stated that based on a typical corrosion rate of carbon steel exposed to seawater of 30 mils per year, the maximum extent of corrosion, should the epoxy coating and gasket be breached to allow access to the original defect area, would be 0.09 inches, assuming a 3-year inspection interval. The licensee further stated that the extent of the bolted plate beyond the defect area is always much greater than 0.09 inches, so any additional corrosion of the defected area would be identified and corrected during the next inspection. The licensee noted that the minimum nominal thickness of the bolted plate is at least as thick as the undamaged piping, so the potential corrosion of the plate is no greater than that of the undamaged piping.

The licensee proposed that RR No. 3 is applicable to the St. Lucie Unit 1 fifth interval, which is scheduled to begin February 11, 2018, and end on February 10, 2028.

3.2 NRC Staff Evaluation

The licensee's proposed alternative, RR No. 3, in accordance with 10 CFR 50.55a(z)(2), permits the installation of internal bolted patch plates on 30-inch diameter ASME Code Class 3 ICW piping, I-30"-CW-29 and I-30"-CW-30, in lieu of repair or replacement in accordance with ASME Code requirements. The proposed alternative would also permit existing repairs performed during previous intervals to remain in place during the fifth interval. The earliest existing repairs that are still in service were installed in 2005. Periodic inspections performed to date have not identified any degradation of existing internal bolted plate repairs. The licensee contends that complying with ASME Code, Section XI, IWA-4000, related to defect removal prior to repair would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

By letter dated August 5, 2013 (Reference 3), as supplemented by letter dated August 30, 2013 (Reference 4), and an e-mail dated November 22, 2013 (Reference 5), the licensee requested approval of RR No. 7 to perform alternate repairs to ICW piping at St. Lucie Unit 1 by installing internal bolted patch plates during the fourth 10-year ISI interval (fourth interval) and allowing previously installed repairs to remain in service during the fourth interval.

The NRC approved RR No. 7 for the fourth interval, which is scheduled to end February 10, 2018, by letter dated January 30, 2014 (Reference 6). Requested alternative, RR No. 3 for the fifth interval, is virtually identical to RR No. 7 for the fourth interval with the exception of the ASME Section XI Code of Record and the reference to a small number of repairs that were performed on 1-30"-CW-29 during the fourth interval.

The NRC staff notes that the design, repair method, and inspection requirements have not changed from the licensee's fourth interval. In support of the fourth interval request, the licensee provided supplemental information in the letter dated August 30, 2013, and the e-mail dated November 22, 2013. This supplemental information was not referenced or provided in the licensee's February 16, 2017, application letter for the fifth interval. In response to an NRC staff request for additional information (RAI) dated August 15, 2017 (Reference 7), the licensee responded by letter dated September 13, 2017 (Reference 2), stating that supplemental information provided in support of its fourth interval RR No. 7 is applicable to its current proposed fifth interval alternative, RR No. 3.

The NRC staff compared the proposed fifth interval RR No. 3 to the previously approved fourth interval RR No. 7 in order to determine if the conclusions in the January 30, 2014, NRC staff RR No. 7 safety evaluation would remain valid for the fifth interval. As stated above, the only difference between the fourth and fifth interval requests are the Section XI Code of Record and the reference to a small number of repairs performed during the current fourth interval. As noted by the licensee, repairs performed as far back as 2005 remain in service, and periodic inspections completed to date have not identified any degradation of the existing internal bolted repairs.

The NRC staff is not aware of any operational experience or other information that would invalidate or modify the NRC staff conclusions detailed in the January 30, 2014, NRC safety evaluation. The NRC staff is also not aware of any change in the St. Lucie Unit 1 licensing basis that would invalidate or modify the NRC staff's January 30, 2014, conclusions.

The NRC staff compared the fourth interval code of record and the fifth interval code of record and determined that no differences exist that would impact the conclusions in the fourth interval NRC safety evaluation related to the design, installation, and inspection of the bolted plate patches. The NRC staff notes that information provided by the licensee for the fourth interval request, which the licensee stated applies to the fifth interval request, supports the use of patch plates with a maximum size of 11 inches by 11 inches and a maximum through-wall hole of 9 inches in diameter. No new information was provided by the licensee for the fifth interval request that would expand these limitations.

Previously installed bolted patch plates have been in service as long as 12 years without any identified degradation. Based on the length of service of existing repairs and the absence of any identified degradation, the NRC staff determines that the conclusions in the fourth interval NRC safety evaluation related to continued operation of previously installed internal bolted plate repairs remain valid.

With respect to the hardship of compliance to IWA-4000 of the ASME Code, Section XI, the licensee explained that removing localized wall thinning per IWA-4000 may result in a through-wall defect and damage to the external coating. If the external coating was not damaged during the defect removal, a traditional repair of cutting a hole and installing a welded rolled plate to return the piping to its original design condition is not possible, as the pipe is buried and the outside of the pipe is not easily accessible. Installation of a rolled plate from the inside of the pipe without access to the outside of the pipe to perform an ASME Code repair would result in damage to the exterior coating that could not be repaired and would prevent nondestructive examination of the exterior of the pipe. The NRC staff finds that the licensee could excavate the degraded buried pipe and repair it in accordance with the ASME Code. However, the NRC staff finds that an ASME Code repair, as compared to the proposed repair, would not increase the quality of the pipe repair, and since the plates are not needed for structural integrity of the pipe, would not increase the safety of the plant. As the pipe discharges cooling water into the ocean, the NRC staff finds that requiring an ASME Code repair of the subject piping would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

In summary, the NRC staff finds that the proposed alternative will provide reasonable assurance of structural integrity and leaktightness of the subject pipe and is acceptable for use for the fifth interval.

## 4.0 CONCLUSION

The NRC staff has determined that the proposed alternative provides reasonable assurance of structural integrity and leaktightness of the intake cooling water piping, 1-30"-CW-29 and 1-30"-CW-30 (discharge piping downstream of component cooling water heat exchangers only). The NRC staff finds that complying with the specified ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC authorizes the use of RR No. 3 at St. Lucie Unit 1 for the fifth 10-year ISI interval, which is scheduled to begin on February 11, 2018, and end on February 10, 2028.

All other requirements of ASME Code, Section XI, for which relief has not been specifically requested and approved in this RR remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

## 5.0 REFERENCES

1. Snyder, Michael J., Florida Power & Light Company, letter to U.S. Nuclear Regulatory Commission, "St. Lucie Unit 1, Docket No. 50-335, Inservice Inspection Plan, Fifth Ten-Year Interval Unit 1 Relief Request No. 3, Revision 0," February 16, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17047A283).

2. Snyder, Michael J., Florida Power & Light Company, letter to U.S. Nuclear Regulatory Commission, "St. Lucie Unit 1, Docket No. 50-335, Inservice Inspection Plan, Fifth Ten-Year Interval Unit 1 Relief Request No. 3, Revision 0," September 13, 2017 (ADAMS Accession No. ML17256A176).

3. Katzman, Eric S., Florida Power & Light Company, letter to U.S. Nuclear Regulatory Commission, "St. Lucie Unit 1, Docket No. 50-335, Inservice Inspection Plan, Fourth Ten-Year Interval Unit 1 Relief Request No. 7, Revision 0," August 5, 2013 (ADAMS Accession No. ML13220A029).

4. Katzman, Eric S., Florida Power & Light Company, letter to U.S. Nuclear Regulatory Commission, "St. Lucie Unit 1, Docket No. 50-335, Inservice Inspection Plan, RAI Response to Fourth Ten-Year Interval Unit 1 Relief Request No. 7, Revision 0," August 30, 2013 (ADAMS Accession No. ML13283A011).

5. Frehafer, Ken, Florida Power & Light Company, electronic mail to U.S. Nuclear Regulatory Commission, "FW: St. Lucie Unit 1 - Additional Clarifications for Relief Request 7 (TAC No. MF2529)," November 22, 2013 (ADAMS Accession No. ML13329A594).

6. Quichocho, Jessie F., U.S. Nuclear Regulatory Commission, letter to Florida Power & Light Company, "St. Lucie Plant, Unit No. 1 – Relief Request No. 7 Regarding Alternate Repair for Intake Colling Water Piping (TAC No. MF2529)," January 30, 2014 (ADAMS Accession No. ML14013A304).

7. Buckberg, Perry H, U.S. Nuclear Regulatory Commission, electronic mail to Florida Power & Light Company, " Final RAI - St Lucie U1 RR No. 3 MF9288.pdf," August 15, 2017 (ADAMS Accession No. ML17228A005).

Principal Contributor: R. Davis

Date: January 4, 2018

SUBJECT: ST. LUCIE PLANT, UNIT NO. 1 – RELIEF FROM THE REQUIREMENTS OF THE ASME CODE RE: RELIEF REQUEST NO. 3 FOR THE FIFTH 10-YEAR INSERVICE INSPECTION INTERVAL (CAC NO. MF9288; EPID L-2017-LLR-0003) DATED JANUARY 4, 2018

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