



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

May 10, 2017

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 – INSERVICE INSPECTION PLAN
FOURTH 10-YEAR INTERVAL RELIEF REQUEST NO. 14 (CAC NO. MF9147)

Dear Mr. Nazar:

By letter dated February 2, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17033A151), as supplemented by email dated February 3, 2017 (ADAMS Accession No. ML17034A315), Florida Power and Light Company submitted 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), regarding alternative requirements for a weld repair examination on the 1B2 Reactor Coolant Pump seal cooler heat exchanger tubing at St. Lucie Unit 1.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.55a(z)(2), the licensee requested to use the proposed alternative on the basis that complying with the specified ASME Code requirements would result in hardship and/or unusual difficulty without a compensating increase in the level of quality and safety.

The Nuclear Regulatory Commission (NRC) staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that the proposed alternative to the ASME Code required examination of the 1B2 Reactor Coolant Pump seal cooler heat exchanger tubing weld repair provides reasonable assurance of structural integrity. Therefore, pursuant to 10 CFR 50.55a(z)(2), the NRC authorizes the use of Relief Request No. 14, Revision 0, at St. Lucie Unit 1 for the fourth 10-Year inservice inspection interval that ends on February 10, 2018. The NRC staff concludes that the weld repair is acceptable for the remaining life of the plant until the end of the period of extended operation, which expires on March 1, 2036.

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

M. Nazar

- 2 -

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

Sincerely,

A handwritten signature in black ink, reading "Benjamin G. Beasley". The signature is written in a cursive style with a large, stylized initial "B".

Benjamin G. Beasley, 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

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 ASME Code Components Affected

The component affected is 1½-inch outside diameter ASME Class 1, SA-213 Type 316 tubing located on the 1B2 RCP seal heat exchanger. The repair weld on the tubing is now designated as RCP Seal FW-2001.

3.2 Applicable Code Addition and Addenda

The Code of Record for the forth 10-year inservice inspection (ISI) interval at St. Lucie Unit 1 is the ASME Code, Section XI, 2001 Edition through the 2003 Addenda.

The code of construction for the RCP seal tube material, which is part of the RCP cover and seal assembly, is ASME Section III Class 1, 1971 Edition through Summer 1973 Addenda.

3.3 Applicable Code Requirement

ASME Code, Section XI, IWA-4421, *Construction Code and Owners Requirements*, states in part:

- (a) Welding, brazing, defect removal, and installation activities shall be performed in accordance with the Owner's requirements and the Construction Code of the component or system, except as provided in (b) and (c) below. The requirements of IWA-4460 shall be used in lieu of Construction Code requirements for mechanical and thermal metal removal. The requirements of IWA-4422 shall be used in lieu of Construction Code requirements for examination of defect removal areas.

IWA-4422.2.2(e), *Defect Removal Followed by Welding or Brazing*, states that examination following welding or brazing shall be in accordance with IWA-4520.

Paragraph (a) of IWA-4520 states:

Welding or brazing areas and welded joints made for installation of items shall be examined in accordance with the Construction Code identified in the Repair/Replacement plan.

The code of construction for the RCP seal tube material is the 1971 Edition through the Summer 1973 Addenda of ASME Section III. This Code has one requirement that applies to the repair.

3.5 Proposed Alternative and Basis for Use

The licensee proposes to perform a progressive dye penetrant (PT) examination of the repair weld (RCP Seal FW-2001) on the 1B2 RCP seal cooler heat exchanger tubing in lieu of an RT examination, which is required by NB-2539.4.

The licensee will perform a PT examination to identify the defect area. An informational PT of the excavation area will be performed to document that the flaw is in the excavation area prior to grinding through wall. This will ensure that once the excavation has gone through wall, the defect will have been removed. The licensee stated that the tube will be purged to eliminate moisture and provide a backing gas while welding. The root pass will be dye penetrant examined to assure weld quality. Subsequent weld layers, until the minimum tube wall is restored, will also be dye penetrant examined to assure weld quality. Once the minimum tube wall is restored, the licensee will apply additional weld metal overlay layer(s) to the repair area and incorporate these layers into the existing fillet weld to provide a smooth transition between the fillet weld and the tube. This transition will resemble a 2:1 fillet weld configuration as much as physical access to the repair region permits, and the final weld repair area will receive a dye penetrant examination to assure the quality of the completed repair. Given that the flaw will be completely removed and that the repair restores the full thickness of the tube, the licensee contends that the original design requirements will be met and the repair will be a lifetime repair. The licensee stated that the progressive dye penetrant examinations are expected to provide a comparable level of quality to the partial penetration and fillet welds used in the RCP seal cooler tube connection welds that are not volumetrically examined.

The licensee's tube base metal repair will utilize ASME Code Section IX qualified welding procedures and qualified welders. The licensee contends that by following ASME Code welding requirements, eliminating the through wall defect in the tube material, restoring the tube wall to the full thickness, including the addition of an overlay in the area of the repair, and performing the final dye penetrant testing, the repair will be Code compliant with the exception of a radiographic examination addressed by its proposed alternative.

Following completion of the weld repair, the licensee will perform a system pressure test of the seal heat exchanger tube, in accordance with ASME Section XI, IWB-5000, to demonstrate leak tightness.

Although there are no ISI requirements for this 1.5 inch seal cooler tube, the licensee stated that a Reactor Coolant System Leak Test is performed every outage during both shutdown and startup. The Reactor Coolant System Leak Test is performed in accordance with plant procedures to verify the integrity of the reactor coolant system (RCS) by identifying any evidence of RCS leakage or boric acid residue. This procedure is credited as part of the site Boric Acid Corrosion Control Program and includes specific inspection areas including the RCP seals, which is the specific area of the repair. The licensee further stated that the Reactor Coolant System ASME Leakage Test procedure is also performed every outage to detect leakage and verify integrity as required by ASME Section XI and plant Technical Specifications for Class 1 piping and components. Both of these procedures will continue to be invoked in future outages and shutdowns and will ensure the continued integrity of the 1B2 RCP seal cooler tube welded repair.

The licensee contends that this proposed alternative is the only available alternative that will allow them to avoid creating hardship or unusual difficulty without a compensating increase in the level of quality or safety.

3.6 Duration of Proposed Alternative

This proposed alternative to the ASME Code is applicable for the repair weld RCP Seal FW-2001, on the 1B2 RCP seal cooler tube only and will remain in place for the remaining service life of St. Lucie Unit 1. The St. Lucie Unit 1 Renewed Facility Operating License No. DPR-67 expires March 1, 2036.

4.0 NRC Staff Evaluation

The leak is located at the toe of the fillet weld that joins the seal cooler tube and the heat exchanger ring as shown in Figure 1 of this evaluation. The licensee proposed to perform a progressive PT examination of repair weld RCP Seal FW-2001 on the 1B2 RCP seal cooler heat exchanger tubing in lieu of the Code required RT examination.

The repair welding of the tube base material will be performed in accordance with ASME Code Section XI, IWA-4400. IWA-4422.2.2(e) requires that final nondestructive examination of the repair weld must be performed in accordance with IWA-4520. IWA-4520 requires that examination of the repair weld be performed in accordance with the Construction Code. ASME Code Section III, NB-2539.4 requires that base metal repairs, such as the one described as part of the licensee's alternative, require an RT examination. Given the geometry of the RCP seal cooling line and heat exchanger assembly, the NRC staff acknowledges that an ASME Code compliant RT examination of the repair weld is not possible.

The licensee's repair includes removing the flaw, purging the tube and restoring the base material. All welding will meet ASME Code requirements. A progressive PT examination of each weld layer, in lieu of an RT examination, will ensure that significant welding flaws in each weld layer will be identified and corrected. In addition, the licensee will apply additional weld metal overlay layer(s) to the repair area and incorporate these layers into the existing fillet weld. This added weld metal will provide additional reinforcement for the tube material and the existing fillet weld and will resemble a 2:1 fillet weld configuration as much as physical access to the repair region permits. The ASME Code required system pressure test, in accordance with ASME Section XI, IWB-5000, will demonstrate leak tightness of the repaired tube.

The NRC staff finds that the licensee's method to repair the leaking tube is acceptable and provides reasonable assurance of structural integrity and leak tightness of the repaired tube because: (1) The welding will be performed in accordance with ASME Code requirements; (2) A progressive PT examination will most likely identify significant weld flaws; (3) The added weld metal applied over the repaired base metal provides additional reinforcement; and (4) Leak tightness will be verified by the Code required system pressure test.

Hardship Justification

The licensee stated that the only feasible option other than the localized repair proposed in its alternative would be the disassembly of the RCP and replacement of the RCP cover that contains the shop fabricated cooler/heat exchanger assembly. The licensee further stated that, based on past experience, the RCP cover replacement would result in a 10.03 Rem dose. As discussed above, the NRC finds that the licensee's alternative provides reasonable assurance of the structural integrity and leak tightness of the repaired tube. The NRC staff concludes that complying with the specified code requirement would result in unnecessary radiation exposure to personnel. Therefore, the NRC staff finds that complying with the specified code requirement

to perform an RT examination of the repaired tube would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

5.0 CONCLUSION

On the basis of the above review, the NRC staff concludes that the proposed alternative, in Relief Request No. 14, provides reasonable assurance of structural integrity of the repaired 1B2 RCP seal cooler heat exchanger tubing. The NRC staff finds that requiring compliance with the ASME Code RT requirements for repair weld RCP Seal FW-2001 on the 1B2 RCP seal cooler heat exchanger tubing would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(z)(2), the NRC authorizes the use of Relief Request No. 14, Revision 0, at St. Lucie Unit 1 for the fourth 10-Year ISI interval that ends on February 10, 2018. The NRC staff concludes that the weld repair is acceptable for the remaining life of the plant until the end of the period of extended operation, which expires on March 1, 2036.

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

Principal Contributor: R. Davis

Date:

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