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

December 6, 2016

Mr. Charles R. Pierce
Regulatory Affairs Director
Southern Nuclear Operating Company, Inc.
P.O. Box 1295 / Bin - 038
Birmingham, AL 35201-1295

SUBJECT: JOSEPH M. FARLEY NUCLEAR PLANT, UNIT 1 – ALTERNATIVE TO INSERVICE INSPECTION REGARDING WELD IN SPENT FUEL POOL COOLING SYSTEM DRAIN LINE (CAC NO. MF8465)

Dear Mr. Pierce:

By letter dated October 14, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16288A796), Southern Nuclear Operating Company, Inc. (SNC or the licensee) requested relief from the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, Appendix IX, Article IX-1000(a), at the Joseph M. Farley Nuclear Plant, Unit 1. The licensee submitted Alternative FNP-ISI-ALT-21, Version 1.0, to use a mechanical clamp in accordance with the ASME Code, Section XI, Appendix IX, for the repair of a 1-inch leaking weld in the drain line of the spent fuel pool cooling system.

Specifically, the licensee submitted the proposed alternative in accordance with the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(2) on the basis that compliance with the specified ASME Code requirements would result in hardship or unusual difficulty, without a compensating increase in the level of quality and safety.

On October 19, 2016 (ADAMS Accession No. ML16293A727), the U.S. Nuclear Regulatory Commission (NRC) staff verbally authorized the use of Alternative FNP-ISI-ALT-21, Version 1.0, until prior to the commencement of the 1R28 refueling outage, currently scheduled for spring 2018, based on the NRC staff's findings that the proposed alternative will provide reasonable assurance of structural integrity and leak tightness of the degraded drain line of the spent fuel cooling system piping. The enclosed safety evaluation documents the technical basis for the NRC staff's verbal authorization. The NRC staff concludes that SNC has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2).

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.

If you have any questions, please contact the Project Manager, Shawn Williams, at 301-415-1009 or by e-mail at Shawn.Williams@nrc.gov.

Sincerely,

Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-348

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ALTERNATIVE FNP-ISI-ALT-21, VERSION 1.0

SOUTHERN NUCLEAR OPERATING COMPANY

JOSEPH M. FARLEY NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-348

1.0 INTRODUCTION

By letter dated October 14, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16288A796), Southern Nuclear Operating Company, Inc. (SNC or the licensee) requested relief from the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, Appendix IX, Article IX-1000(a) at the Joseph M. Farley Nuclear Plant, Unit 1 (FNP). The licensee submitted Alternative FNP-ISI-ALT-21, Version 1.0, to use a mechanical clamp in accordance with the ASME Code, Section XI, Appendix IX, for the repair of a 1-inch leaking weld in the drain line of the spent fuel pool cooling system.

Specifically, the licensee submitted the proposed alternative in accordance with the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(2) on the basis that compliance with the specified ASME Code requirements would result in hardship or unusual difficulty, without a compensating increase in the level of quality and safety.

On October 19, 2016 (ADAMS Accession No. ML16293A727), the U.S. Nuclear Regulatory Commission (NRC) staff verbally authorized the use of Alternative FNP-ISI-ALT-21, Version 1.0, until prior to the commencement of the 1R28 refueling outage, currently scheduled for spring 2018, based on the NRC staff findings that the proposed alternative will provide reasonable assurance of structural integrity and leak tightness of the degraded drain line of the spent fuel cooling system piping. This safety evaluation documents the technical basis for the NRC staff's verbal authorization.

2.0 REGULATORY EVALUATION

Section 50.55a(g)(4) of 10 CFR states, in part, that ASME Code Class 1, 2, and 3, components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components."

Section 50.55a(z) of 10 CFR states, in part, that alternatives to the requirements of 10 CFR 50.55a(g) may be used when authorized by the NRC if the licensee demonstrates that (1) the proposed alternatives would provide 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, and the NRC staff to grant, the relief requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Component(s) Affected

The affected component is ASME Code Class 3, stainless steel socket weld on line 1"-HCC-110, upstream side of drain valve Q1G31V017 in the spent fuel pool cooling system.

3.2 Applicable Code Edition and Addenda

ASME Code, Section XI, 2001 Edition through 2003 Addenda.

3.3 Applicable Code Requirement

ASME Code, Section XI, Appendix IX, Article IX-1000(a), specifies that, "Mechanical clamping devices used as piping pressure boundary may remain in service only until the next refueling outage, at which time the defect shall be removed or reduced to an acceptable size."

3.4 Reason for Request

On October 11, 2016, during the 1R27 refueling outage, the licensee discovered a through-wall leak at a socket weld on valve Q1G31V017, a 1-inch drain line off of the 8-inch spent fuel pool cooling common return header. The licensee stated that the leak location cannot be isolated using normal means because there is no isolation valve between the leak location and the spent fuel pool. Also, the spent fuel pools are not cross-connected to allow cooling from the opposite unit. The licensee visually characterized the leak as a circumferentially oriented linear indication at the toe of the socket weld at the valve. The licensee stated that to perform a permanent ASME Code repair or replacement (i.e., pipe replacement, or flaw removal and re-welding) at the location of the leak, both trains of the spent fuel pool cooling system will have to be removed from service and a non-conventional tagging boundary (e.g., freeze seal) will be required for personnel safety, to perform hot work, and to maintain the required inventory in the spent fuel pool. The licensee stated that the total estimated time for establishing the boundary, implementing the code repair, and returning the spent fuel pool system to service is 24 hours.

The licensee discovered the leak after the reactor core was offloaded to the spent fuel pool. The licensee stated that performing a permanent repair during the 1R27 refueling outage with the reactor core offloaded, or even shortly after the core reload, is not a viable option based upon reaching 200 degrees Fahrenheit (°F) within approximately 10 hours, if no spent fuel pool cooling were available. The estimated time to reach 200 °F in the spent fuel pool, if cooling

were removed from service, will increase throughout the operating cycle as the decay heat from the fuel decreases. The earliest the licensee would consider performing the permanent repair, assuming no significant degradation, would be after decay heat is reduced sufficiently to allow time to perform the repair with margin. The desire would be to conduct the repair at least 40 to 50 weeks after the core reload. After 40 to 50 weeks, the decay heat would be low enough so that it would take at least 72 hours to reach 200 °F after spent fuel pool cooling is removed from service. The time to 200 °F is dependent on the initial spent fuel pool temperature when cooling is removed from service, which is related to environmental factors (i.e., service water temperatures).

The licensee stated that it has entered the degradation into the corrective action program, and the work management process will ensure the evolution is planned at the appropriate time and executed in a manner to manage the risk of the maintenance activity.

3.5 Proposed Alternative

In lieu of permanently repairing the subject pipe in accordance with the ASME Code, the licensee proposes to install a mechanical clamping device in accordance with the ASME Code, Section XI, Appendix IX, except Article IX-1000(a), during and prior to the startup from the 1R20 refueling outage to repair the through-wall leak on the line 1"-HCC-110.

The licensee stated that it cannot satisfy Article IX-1000(a), which requires that, "Mechanical clamping devices used as piping pressure boundary may remain in service only until the next refueling outage, at which time the defect shall be removed or reduced to an acceptable size."

The requirements for the proposed alternative are summarized below.

General Requirements

ASME Code, Section XI, Appendix IX, Article IX-1000, "General," prohibits the use of the clamp in the following situations: Class 1 piping, a portion of piping that forms the containment boundary, high energy piping with a nominal pipe size of greater than 2, and piping larger than a nominal pipe size of 6. The article requires that the clamp can only remain in service until the next refueling outage. The licensee is required to develop a repair/replacement plan in accordance with the ASME Code, Section XI, IWA-4150, and to identify the defect characterization method, design requirements, and monitoring requirements as discussed below. If welding is needed, the licensee is required to satisfy the requirements of IWA-4400.

Pre-Installation Evaluation

The licensee will perform pre-installation evaluation in accordance with Article IX-2000, "Defect Characterization," which specifies that the size, location, and apparent cause of the defect be determined. The defect size will be bounded to account for nondestructive examination limitations. If the defect size cannot be directly determined, a conservative bound of the defect size will be determined and documented.

Design Requirements

The licensee will design the clamp in accordance with Article IX-3000, "Design Requirements," which requires that the piping system configuration with the clamp be evaluated in accordance with the owner's requirements and either the Construction Code or the ASME Code, Section III. The clamp and associated parts will be designed based on a stress analysis using the stress limits identified in the ASME Code, Section XI, Appendix IX, Table IX-3200-1, for the loading conditions specified in the owner's requirements for the system.

The licensee will select clamp material in accordance with Article IX-4000, "Material Requirements," which requires that the clamp material meet the technical requirements of the ASME Code, Section XI, IWA-4220, and be furnished with certified material test reports.

Pressure Testing

After the clamp is installed, the licensee will perform pressure testing in accordance with Article IX-5000, "Pressure Testing Requirements," which requires that a system leakage test be performed in accordance with the ASME Code, Section XI, IWA-5000, on the portion of the piping system containing the clamp.

Monitoring

The licensee will monitor the clamp in accordance with Article IX-6000, "Monitoring Requirements," which requires that the area immediately adjacent to the clamping device be volumetrically examined. The examination frequency will not exceed 3 months. When the examination reveals defect growth to a size that exceeds the projected size determined by Article IX-3100(b), the defect will be removed or reduced to an acceptable size. Article IX-6000 requires that the clamp be monitored for leakage at least weekly. Any leakage at any time shall be dispositioned. As a compensatory measure, the licensee states that it will monitor the temporary repair (the clamp) at least once a day.

3.6 Basis for Use

The ASME Code, Section XI, Appendix IX, Article IX-1000(a), specifies that, "Mechanical clamping devices used as piping pressure boundary may remain in services only until the next refueling outage." However, since the unit is currently in the 1R27 refueling outage, the licensee interpreted Article IX-1000(a) as to need implementation of a permanent code repair/replacement prior to startup from the 1R27 refueling outage. The licensee stated that the optimum time for repair of the leak from a decay heat load perspective is just prior to the next refueling outage. This will allow for the maximum time with adequate margin to repair or replace the weld while still protecting the fuel in the spent fuel pool. The licensee proposed to install an ASME Code-compliant mechanical clamping device on the leak during the current 1R27 refueling outage and repair or replace the leaking weld prior to the next refueling outage (1R28). The licensee estimated that the time to 200 °F for the spent fuel pool, after cooling is removed from service, will be at least 72 hours within 40 to 50 weeks after the 1R27 refueling outage. Installing the temporary repair now, and scheduling the permanent repair later in the cycle, will allow ample time with margin to isolate the leak, repair and inspect the weld, and return the system to service, while ensuring the fuel in the spent fuel pool remains adequately cool. Temporary repairs utilizing ASME Code, Section XI, Appendix IX, are typically

implemented on-line and left in place until plant shutdown. For the circumstances of this request, a refueling outage presents the greatest risk to the decay heat removal functionality of the spent fuel pool.

3.7 Duration of Proposed Alternative

The licensee stated that the alternative will remain in effect until prior to the commencement of the 1R28 refueling outage, currently scheduled for spring 2018. The fourth inservice inspection interval extends from December 1, 2007, through November 30, 2017.

4.0 NRC STAFF EVALUATION

The NRC staff evaluated the proposed alternative in accordance with the ASME Code, Section XI, Appendix IX, except Article IX-1000(a).

General Requirements

The NRC staff finds that the proposed alternative is in compliance with the prohibition as stated in Article IX-1000. The licensee stated that it will replace the clamp prior to the next refueling outage (1R28). The NRC staff finds that the repair plan will be developed in accordance with the ASME Code, Section XI, IWA-4150. Therefore, the NRC staff concludes that the proposed repair is in compliance with Article IX-1000, except IX-1000(a).

The NRC staff concludes that the licensee's deviation from Article IX-1000(a) is acceptable based on the licensee's hardship justification as discussed below. The NRC staff finds that deviation from Article IX-1000(a) does not diminish the structural integrity of the proposed clamp design, because the proposed clamp will be designed in accordance with most of the requirements of the ASME Code, Section XI, Appendix IX.

Pre-Installation Evaluation

The NRC staff notes that the pre-installation evaluation will provide information of the degradation to assist in the clamp design. The NRC staff concludes it acceptable that the licensee will characterize the defect in the subject piping in accordance with Article IX-2000 prior to installing the clamp.

Design Requirements

The NRC staff finds that the licensee will design and evaluate the clamp in accordance with the owner's requirements, and either the Construction Code or the ASME Code, Section III. In addition, the licensee will design the clamp based on a stress analysis using the stress limits as specified in the ASME Code, Section XI, Appendix IX, Table IX-3200-1, for the loading conditions specified in the owner's requirements for the piping system. The licensee will select clamp material to meet the requirements of the ASME Code, Section XI, IWA-4220. The NRC staff concludes that the structural integrity of the repaired drain line will be ensured because the clamp design follows the Construction Code or ASME Code, Section III, and the ASME Code, Section XI, Appendix IX-3000.

Pressure Testing

The NRC staff concludes it is acceptable that the licensee will perform pressure testing in accordance with the ASME Code, Section XI, IWA-5000. The NRC staff notes that as part of the pressure testing, the licensee is required to perform a VT-2 visual examination of the repaired drain line for leakage in accordance with IWA-5000. The VT-2 examination will ensure the leak tightness of the clamp repair.

Monitoring

The NRC staff finds that the licensee will perform volumetric examination of the area immediately adjacent to the clamp at least every 3 months in accordance with Article IX-6000. When the examination reveals defect growth to a size that exceeds the projected size determined by Article IX-3100(b), the defect will be removed or reduced to an acceptable size. The licensee stated that it will monitor the repair once a day and will disposition any leakage detected. The NRC concludes that the proposed monitoring is acceptable because the licensee will follow the requirements of Article IX-6000 and monitor the repair once a day.

Hardship Justification

The licensee stated that the subject spent fuel pool cooling piping is needed during the refueling outage to provide cooling to the spent fuel pool. The degraded location cannot be isolated to effect an ASME Code repair. If an ASME Code repair is performed during the current 1R27 refueling outage, it presents a risk to the decay heat removal functionality of the spent fuel pool. Therefore, the NRC staff has determined that complying with the ASME Code requirement would result in hardship or unusual difficulty, without a compensating increase in the level of quality and safety.

Conclusion

Based on the above, the NRC staff concludes that the proposed alternative provides reasonable assurance of structural integrity and leak tightness of the repaired drain line of the spent fuel cooling system piping

5.0 CONCLUSION

The NRC staff concludes that the proposed alternative provides reasonable assurance of structural integrity and leak tightness of the repaired drain line of the spent fuel cooling system piping. The NRC staff determines that complying with the ASME Code requirement 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 staff authorizes the use of Alternative FNP-ISI-ALT-21, Version 1.0, at FNP, Unit 1, until prior to the commencement of the 1R28 refueling outage, currently scheduled for spring 2018.

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

Principal Contributor: J. Tsao

Date: December 6, 2016

If you have any questions, please contact the Project Manager, Shawn Williams, at 301-415-1009 or by e-mail at Shawn.Williams@nrc.gov.

Sincerely,

/RA/

Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-348

Enclosure:
Safety Evaluation

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