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

December 8, 2017

Mr. James J. Hutto
Regulatory Affairs Director
Southern Nuclear Operating Company, Inc.
P.O. Box 1295 / Bin - 038
Birmingham, AL 35201-1295

SUBJECT: VOGTLE ELECTRIC GENERATING PLANT, UNIT 2 – PROPOSED ALTERNATIVE ISI-ALT-04-03 REGARDING THE REPAIR OF A PIPE ON THE STEAM GENERATOR (CAC NO. MF9922; EPID L-2017-LLR-0048)

Dear Mr. Hutto:

By letter dated July 10, 2017, Southern Nuclear Operating Company (SNC, the licensee) submitted a proposed alternative, VEGP-ISI-ALT-04-03, from certain inservice inspection (ISI) requirements of Section XI, Appendix IX, of the 2007 Edition through the 2008 Addenda of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (BPV) Code for the Vogtle Electric Generating Plant (VEGP), Unit 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50.55a(z)(2), the licensee proposed an alternative to Section XI, Mandatory Appendix IX, "Mechanical Clamping Devices for Class 2 and 3 Piping Pressure Boundary," Article IX-1000(c)(2), that states that clamping devices shall not be used on portions of a piping system that forms the containment boundary.

On July 12, 2017, the U.S. Nuclear Regulatory Commission (NRC) granted temporary verbal authorization for VEGP-ISI-ALT-04-03 for the use of a mechanical clamping device in the repair of a leak on the ¾-inch pipe stub off of steam generator No. 2 until a permanent ASME BPV Code repair/replacement is implemented following the VEGP, Unit 2, Refueling Outage 19 (2R19) during fall 2017. The NRC review concluded that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety and that SNC adequately addressed all of the regulatory requirements. The enclosed safety evaluation provides the final regulatory and technical evaluation that authorizes VEGP-ISI-ALT-04-03 in accordance with 10 CFR 50.55a(z)(2).

All other ASME BPV Code requirements for which an alternative was not specifically requested and authorized herein by the NRC staff remain applicable.

If you have any questions, please contact the Project Manager, Michael Orenak, at 301-415-3229 or by e-mail at Michael.Orenak@nrc.gov.

Sincerely,

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

Docket Nos. 50-425

Enclosure:
Safety Evaluation

cc w/encl: Listserv

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

PROPOSED ALTERNATIVE VEGP-ISI-ALT-04-03

ALTERNATE REPAIR OF INSTRUMENT LINE OFF STEAM GENERATOR NO. 2

VOGTLE ELECTRIC GENERATING PLANT, UNIT 2

SOUTHERN NUCLEAR OPERATING COMPANY

DOCKET NO. 50-425

1.0 INTRODUCTION

By letter dated July 10, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17192A170), Southern Nuclear Operating Company (the licensee), requested an alternative to the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (BPV Code) Section XI, Appendix IX, regarding the alternative repair of a ¾-inch pipe stub off of steam generator (SG) No. 2 at Vogtle Electric Generating Plant, Unit 2 (VEGP).

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

On July 12, 2017 (ADAMS Accession No. ML17193A479), the U.S. Nuclear Regulatory Commission (NRC) provided a temporary verbal authorization of VEGP ISI-ALT-04-03 for the use of a mechanical clamping device in the repair of a leak on the ¾-inch pipe stub off of SG No. 2, until a permanent ASME BPV Code repair/replacement is implemented following the VEGP Refueling Outage 19 (2R19) during the fall of 2017. The NRC staff review concluded that requiring the ASME BPV Code repair constitutes a hardship without a compensating increase in the level of quality and safety and that licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). This safety evaluation (SE) provides the final regulatory and technical evaluation that authorizes VEGP-ISI-ALT-04-03 in accordance with 10 CFR 50.55a(z)(2).

2.0 REGULATORY EVALUATION

In accordance with 10 CFR 50.55a(g)(4), "Inservice inspection [ISI] standards requirement for operating plants," the licensee is required to perform ISI of ASME Code Class 1, 2, and 3 components and system pressure tests during the first 10-year interval and subsequent 10-year intervals that comply with the requirements in the latest edition and addenda of Section XI of the

ASME BPV Code incorporated by reference in 10 CFR 50.55a(a), subject to the limitations and modifications listed in 10 CFR 50.55a(b).

Pursuant to 10 CFR 50.55a(z), "Alternatives to codes and standards requirements," alternatives to the requirements of paragraphs (b) through (h) of this 10 CFR 50.55a or portions thereof may be used when authorized by the Director, Office of Nuclear Reactor Regulation. A proposed alternative must be submitted and authorized prior to implementation. The applicant or licensee must demonstrate that: (1) "Acceptable Level of Quality and Safety," the proposed alternative would provide an acceptable level of quality and safety; or (2) "Hardship without a Compensating Increase in Quality and Safety," compliance with the specified requirements of this 10 CFR 50.55a 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 the licensee may propose an alternative to the ASME BPV Code, Section XI, and the NRC staff has the regulatory authority to authorize the licensee's proposed alternative.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Component Affected

Code Class: 2
Description: Pipe-to-cap Socket Weld on ¾-inch line off SG No. 2 (secondary side), Narrow Range Level Transmitter line (capped in 1990)

3.2 Applicable Code Edition and Addenda

The current edition for the ISI interval is the ASME BPV Code, Section XI, 2007 Edition with the 2008 Addenda.

3.3 Applicable Code Requirements

ASME BPV Code, Section XI, Mandatory Appendix IX, "Mechanical Clamping Devices for Class 2 and 3 Piping Pressure Boundary." Article IX-1000(c)(2) states:

> Clamping devices shall not be used on portions of a piping system that forms the containment boundary.

3.4 Reason for Proposing an Alternative

In its letter dated June 28, 2017, the licensee stated:

> On June 28, 2017 Southern Nuclear Operating Company (SNC) Operations, after noting increased leakage into the Unit 2 containment sumps, performed a walk-down of containment which revealed a steam leak from a 3/4-inch pipe-to-cap socket weld off the SG No. 2 shell. The pipe stub is an abandoned instrument nozzle (narrow range level transmitter line) that was capped in 1990. The leak appeared to be at the base of the toe of the weld at the pipe cap, and the leak could not be isolated from Steam Generator #2. The leak, measured at less than 1 gpm [gallon per minute], has shown no appreciable day-to-day increase based on the filling and draining operations of the normal containment

sumps. In addition, there has been no measurable effects on containment pressure or temperature due to the leak. At the time of discovery of the leak, Unit 2 was at 100% percent power.

The leaking line extends off the SG which is considered part of the containment boundary per plant design, and therefore, does not satisfy the provision of Mandatory Appendix IX Article IX-1000, Subparagraph (c)(2).

3.5 Proposed Alternative

The licensee stated that in lieu of immediately implementing a permanent ASME BPV Code repair/replacement, the licensee proposed to install a mechanical clamping device in accordance with ASME BPV Code, Section XI, Mandatory Appendix IX, on the ¾-inch pipe-to-cap socket weld off the SG No. 2 shell. As a compensatory measurement, the licensee will continue to monitor the temporary repair daily through the use of leak rate calculations and remote video monitoring equipment.

3.6 Basis for Use

In its letter dated June 28, 2017, the licensee stated:

> Appendix IX, Article IX-1000(c)(2) specifies that "clamping devices shall not be used on portions of a piping system that forms the containment boundary." While the steam generator shell and piping is ASME Code Class 2, the leak is located off a 3/4-inch line from the SG shell which is defined as part of the containment boundary in the design basis for VEGP Unit 2. SNC proposes to install a mechanical clamping device compliant with all other aspects of Articles IX-1000 through IX-6000 of Mandatory Appendix IX. The design will address the design requirements in Article IX-3000 for adding the Appendix IX clamp to the steam generator instrument nozzle using SNC's design processes. The design will require consideration of structural load combinations including seismic, dead weight, and pressure. In addition, thermal cycling and fatigue will be addressed. A final VT-2 visual examination of the installed clamp will be performed to satisfy the pressure test requirements of Article IX-5000. A detailed monitoring plan will be implemented consistent with Article IX-6000 and will be specified in the Repair/Replacement Plan. The volumetric examination specified in Article IX-6000 is not required because the flaw is a circumferential crack meeting the exception provided under subsection (b). In addition, the Appendix IX clamp will not be installed in excess of the 3-month examination frequency specified in Article IX-6000. SNC will implement a permanent Code repair/replacement on the flawed weld no later than the end of the Unit 2 Refueling Outage 19 (2R19) which is scheduled to start on September 17, 2017.
>
> Pursuant to the code exception quoted above, the purpose of the mechanical device, from a containment perspective, will be only to mitigate further degradation of the identified flaw rather than to eliminate the potential leakage path to the environment via the flaw. A combination of analyses, demonstrating acceptability of the existing flaw size and monitoring of the clamped flaw after installation, will ensure containment operability is maintained until a permanent code repair can be completed.

> Based on the location and size of the flaw, the current leak is well below the calculated Technical Specification allowable containment leakage, and as such, does not present a higher risk for exceeding containment leakage limits if a OBA event were to occur prior to a permanent Code repair/replacement.
>
> The mechanical clamping device will provide structural support and act as a pressure retaining device for the current flaw. These functions will substantially reduce or eliminate further steam leakage from the flaw, mitigating the driving mechanism for additional degradation of the weld. Installing the mechanical clamp now and scheduling the repair during the outage will allow the outage management team to ensure the evolution is properly planned and executed in a manner to manage the risk of the maintenance activity.
>
> Pursuant to 10CFR50.55a(z)(2), an alternative is being requested by SNC for VEGP Unit 2 based on hardship without a compensating increase in quality and safety in the repair of a leak on a 3/4-inch pipe-to-cap socket weld on SG #2 to allow the temporary repair to be in place until no later than the end of the Unit 2 Refueling Outage 19 (2R19) which is scheduled to start on September 17, 2017.

To perform a permanent ASME BPV Code repair/replacement would have required VEGP to shutdown to Mode 5, cooldown, depressurize, and drain the SG. The licensee stated that considering the additional structural and pressure retaining properties of the mechanical clamp, the hardship resulting from cycling the plant and burden to plant operations to perform an unplanned shutdown is not justified by a compensating increase in the level of quality and safety.

3.7 Safety Basis for Use

In its letter dated June 28, 2017, the licensee stated:

> The VEGP Technical Specifications (TS) 5.5.17 "Containment Leakage Rate Testing Program" required maximum allowable containment leakage rate, La, at peak accident pressure (Pa), is 0.2% of primary containment air weight per day. If this requirement is not met, Surveillance Requirement 3.0.1 requires the containment to be declared inoperable.
>
> The VEGP FSAR Table 6.2.4-1, footnote (i) discusses the steam generator piping and valves associated with the secondary side of the steam generators and states that these form the primary boundary to the outside environment. This Class 2 piping inside containment is treated as part of the containment boundary with a verification of integrity of the boundary accomplished during an integrated leak rate test (ILRT). The steam generator would likely be pressurized and water-filled following a design basis LOCA.

The licensee performed a calculation of the containment leakage margin after factoring in the leakage of the SG No. 2 instrument tap and found that VEGP remains within the assumptions in the FSAR, considering the current leakage of less than one gpm. The licensee stated that the leakage rate will continuously be closely monitored through the period of use for this mechanical clamping device.

As a compensatory measure, the licensee uses a camera inside of containment to monitor the leakage rate and daily observes the filling and draining operations of the normal containment sumps.

The licensee contracted with a third-party vendor to assess the structural integrity of the intact portion of the weld using methods consistent with the ASME BPV Code. The nominal wall thickness (nominal throat of the fillet weld) was calculated to be 0.176 inches and the impact of the remaining ligaments were parametrically evaluated. The licensee assumed full circumferential degradation in their calculations by keeping the outer diameter (OD) constant and increasing the inner diameter (ID), and concluded that at the current leakage rate, the current through wall flaw length is about 0.4 to 0.45 inches. With the current flaw and leakage monitoring plan, the licensee concluded VEGP can operate safely and within its safety basis for the period of time necessary to complete fabrication and installation of the Appendix IX mechanical clamping device.

3.8 Duration of Alternative

The licensee stated that the alternative is applicable until the end of 2R19, which is scheduled to start on September 17, 2017.

4.0 NRC STAFF EVALUATION

The licensee proposed to install a mechanical clamping device in accordance with Appendix IX, of the ASME BPV Code, Section XI, 2007 Edition with 2008 Addenda. However, the licensee asked for an alternative to the requirement of Appendix IX, Article IX-1000(c)(2), which prohibits the use of a mechanical clamping device on the containment boundary. The licensee is requesting an alternative to the containment boundary exception in the ASME BPV Code requirements because the mechanical clamping device will not be credited as fulfilling the containment boundary function during its use. The mechanical clamping device shall only be credited as providing a means for mitigating substantial degradation of the existing flaw during its use.

4.1 Mechanical Clamping Device

The NRC staff reviewed the licensee's proposed alternative regarding the design, installation, and material selection for the mechanical clamping device.

For the mechanical clamping device design, the licensee will consider structural load combinations including seismic, dead weight, and pressure, and will address the thermal cycling and fatigue. The structural loading combinations will satisfy the stress limits as specified in Table IX-3200-1 of Article IX-3000. Therefore, the NRC staff finds that the mechanical clamping device design satisfies Article IX-3000, "Design Requirements."

Regarding mechanical clamping device installation, the NRC staff finds it acceptable that the licensee will follow article IX-1000(2) that requires the welding performed as part of the fabrication and installation of the clamping device be in accordance with the requirements of IWA-4400, "Welding, Brazing, Metal Removal, Fabrication, and Installation."

The material composition of the clamp is carbon steel and meets the requirements of SA516 - Grade 70. The material composition of the existing pipe and pipe cap is carbon steel, meeting the requirements of SA106 and SA105, respectively. The weld filler material for the

socket welded pipe cap is E7018 and was fabricated in accordance with ASME BPV Code, Section II, Appendix C, SFA-5.1/SFA-5.1M. The NRC staff finds that the mechanical clamping device material is consistent with the pipe material and article IX-4000, "Material Requirements."

Based on the above, the NRC staff finds that the mechanical clamping device will provide structural support and act as a pressure retaining device for the current flaw, ensuring the structural integrity of the subject piping.

4.2 Flaw Characterization

The licensee stated that it is not possible to categorize the flaw in the weld with ultrasonic techniques, and that there likely is degradation and/or weld defects at the weld root. Therefore, the nominal wall thickness (nominal throat of the fillet weld) was calculated to be 0.176 inches and the impact of remaining ligament parametrically evaluated. The licensee kept the OD constant and increased the ID, which results in a conservative assumption of full circumferential degradation. The licensee stated that at the current leakage rate, the current through wall flaw length is approximately 0.4 to 0.45 inches. With the current flaw and leakage monitoring plan, the NRC staff finds that VEGP can operate safely and within its safety basis for the period of time necessary to complete fabrication and installation of the Appendix IX mechanical clamping device. Additionally, Appendix IX-2000, "Defect Characterization," states that if the defect size cannot be directly determined, a conservative bound of the defect size shall be determined and documented. Based on the conservative assumption of full circumferential degradation of the weld, the NRC staff finds the licensee satisfies the requirements of Appendix IX-2000.

4.3 Examinations

The licensee will perform a final VT-2 visual examination of the installed mechanical clamping device to satisfy the pressure test requirements of Article IX-5000, "Pressure Testing Requirements." The NRC staff finds this acceptable because it is consistent with IWA-5000, "System Pressure Tests."

The licensee stated that the volumetric examination specified in Article IX-6000 is not required because the flaw is a circumferential crack meeting the exception provided under subsection IX-6000(b). Additionally, the mechanical clamping device will not be installed in excess of the 3-month examination frequency specified in Article IX-6000(a). Therefore, the NRC staff finds that performance of the volumetric examination will not be required.

4.4 Monitoring

The licensee will implement a monitoring plan consistent with Article IX-6000 and will specify it in the repair/replacement plan. The licensee will monitor the leakage using a camera inside of containment and daily monitoring leakage through the filling and draining operations of the normal containment sumps. The licensee will also monitor the potential leakage via containment sump. The NRC staff finds that the licensee has satisfied Article IX-6000, "Monitoring Requirements."

4.5 Containment Boundary Integrity

The licensee evaluated potential containment leakage caused by the flaw in the pipe stub and demonstrated that the projected containment leakage has sufficient margin with respect to the TS L_a. VEGP has an L_a of 380,456 standard cubic centimeters per minute (sccm). The last

measured total leakage at VEGP was measured to be 207,920 sccm and, therefore, the calculated margin is 172,536 sccm. The flaw currently leaks at less than one gpm and a leak of 10 gpm would be needed to surpass L_a. As stated in Section 4.4 above, the licensee will monitor the repair and potential leakage with a remote camera and the filling and draining operations of the normal containment sumps, which should identify an increasing flaw leak rate well before surpassing L_a.

Given that the mechanical clamping device will control leakage and arrest the growth of the crack, the current leak rate is low (1 gpm), and that the licensee's monitoring would identify an increasing leakage rate well before the leak surpasses L_a, the installation of the mechanical clamping device does not present a higher risk for exceeding containment leakage limits if a design basis accident event were to occur prior to a permanent ASME BPV Code repair/replacement. Therefore, the NRC staff concludes that the application of a mechanical clamping device will not adversely affect containment boundary integrity.

4.6 Hardship

The NRC staff finds that cycling the plant for an unplanned shutdown to perform the required ASME BPV Code repair does present unusual difficulty and may cause unnecessary loading on safety-related components and, therefore, would present a hardship for the licensee.

4.7 Summary

Based on the above, the NRC staff finds that the licensee's mechanical clamping device design, flaw characterization, examinations, and monitoring of the clamped flaw will ensure the integrity of the subject piping and containment boundary until a permanent ASME BPV Code repair can be completed. Additionally, the NRC staff finds that a hardship exists for the licensee. Therefore, the NRC staff concludes that requiring the ASME BPV Code repair constitutes a hardship without a compensating increase in the level of quality and safety.

5.0 CONCLUSION

As set forth above, the NRC staff determines that it has the regulatory authority to authorize the proposed alternative and that complying with Appendix IX, Article IX-1000(c)(2), 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 ISI-ALT-04-03 at VEGP until the end of 2R19, which is scheduled to start on September 17, 2017.

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

Principle Contributor: D. Render

Date: December 8, 2017

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