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

January 25, 2018

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

SUBJECT: EDWIN I. HATCH NUCLEAR PLANT, UNITS 1 AND 2, AND JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2 – INSERVICE INSPECTION ALTERNATIVE GEN-ISI-ALT-2017-02, VERSION 1.0, REGARDING THE USE OF ASME CODE CASE N-789-1 (CAC NOS. MF9942, MF9943, MF9944, AND MF9945; EPID L-2017-LLR-0059)

Dear Mr. Hutto:

By letter dated July 3, 2017, Southern Nuclear Operating Company, Inc., (SNC, the licensee) submitted proposed alternatives GEN-ISI-ALT-2017-01 and GEN-ISI-ALT-2017-02. This correspondence addresses proposed alternative GEN-ISI-ALT-2017-02. Proposed alternative GEN-ISI-ALT-2017-01 will be addressed in a separate correspondence.

In GEN-ISI-ALT-2017-02, SNC proposed to utilize American Society of Mechanical Engineers (ASME) Code Case N-789-1, "Alternative Requirements for Pad Reinforcement of Class 2 and 3 Moderate-Energy Carbon Steel Piping for Raw Water Service, Section XI, Division 1," to repair raw water piping, thereby, restoring structural integrity and/or leak tightness to the degraded pipe for the Edwin. I Hatch Nuclear Plant (HNP), Units 1 and 2, and the Joseph M. Farley Nuclear Plant (FNP), Units 1 and 2.

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

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the proposed alternative and concludes, as set forth in the enclosed safety evaluation, 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 proposed alternative GEN-ISI-ALT-2017-02 for the fifth 10-year inservice inspection (ISI) intervals at HNP, Units 1 and 2, which began on January 1, 2016, and ends on December 30, 2025, and for FNP, Units 1 and 2, which began on December 1, 2016, and ends on November 30, 2027.

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

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. 50-321, 50-366,
50-348, and 50-364

Enclosure:
Safety Evaluation

cc: Listserv

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

PROPOSED ALTERNATIVE GEN-ISI-ALT-2017-02

REGARDING THE USE OF CODE CASE N-789-1

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

EDWIN I. HATCH NUCLEAR PLANT, UNITS 1 AND 2

JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-321, 50-366, 50-348, AND 50-364

1.0 INTRODUCTION

By letter dated July 3, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17184A184), Southern Nuclear Operating Company, Inc., (SNC, the licensee) submitted proposed alternatives GEN-ISI-ALT-2017-01 and GEN-ISI-ALT-2017-02. This safety evaluation addresses proposed alternative GEN-ISI-ALT-2017-02. Proposed alternative GEN-ISI-ALT-2017-01 will be addressed in a separate evaluation.

In GEN-ISI-ALT-02, SNC proposed to utilize American Society of Mechanical Engineers (ASME) Code Case N-789-1, "Alternative Requirements for Pad Reinforcement of Class 2 and 3 Moderate-Energy Carbon Steel Piping for Raw Water Service, Section XI, Division 1," to repair raw water piping, thereby, restoring structural integrity and/or leak tightness to the degraded pipe for the Edwin. I Hatch Nuclear Plant (HNP), Units 1 and 2, and the Joseph M. Farley Nuclear Plant (FNP), Units 1 and 2.

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

2.0 REGULATORY EVALUATION

Adherence to Section XI of the ASME Boiler and Pressure Vessel (BPV) 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 pre-service examination requirements, set forth in the ASME BPV 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 U.S. Nuclear Regulatory Commission (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 BPV Code Component(s) Affected

The affected components are ASME Code Class 2 and 3 moderate energy, carbon steel, raw water piping systems. Raw water is defined as water such as river, lake, well or brackish/salt water used in plant equipment, area coolers, and heat exchangers. Moderate energy is defined as less than or equal to 200 °F (93 °C) and less than or equal to 275 psig (1.9 MPa) maximum operating conditions.

3.2 Applicable Code Edition and Addenda

In its letter dated July 3, 2017, the licensee identified the following ASME BPV Code, Section XI, Code of Record and the current 10-year inservice inspection (ISI) interval.

PLANT	ISI INTERVAL	ASME BPV CODE EDITION	START	END
Farley Nuclear Plant Units 1 and 2	5th	2007 Edition, 2008 Addenda	12/01/2017	11/30/2027
Hatch Nuclear Plant Units 1 and 2	5th	2007 Edition, 2008 Addenda	01/01/2016	12/31/2025

3.3 Applicable Code Requirement

The ASME BPV Code, Section XI, IWA-4000 provides requirements for welding, brazing, metal removal, and installation of repair/replacement activities.

Article IWA-4400 of the ASME BPV Code, Section XI, requires that unacceptable flaws in ASME Code Class 2 and 3 components be corrected by repair or replacement activity or be accepted by supplemental examination and flaw evaluation.

3.4 Reason for Request

The licensee proposed an alternative to the requirement for replacement or internal weld repair of wall thinning conditions resulting from degradation in Class 2 and 3 moderate energy, carbon

steel raw water piping systems in accordance with the ASME BPV Code, Section XI, IWA-4000. The licensee stated that the repair replacement provisions of IWA-4000 cannot always be utilized when degradation or leakage is identified during plant operations. The licensee further stated that other approved alternative repair or evaluation methods are not always practical because of wall thinness and/or moisture issues.

The licensee stated that the proposed alternative will permit installation of a technically sound temporary repair to provide adequate time for evaluation, design, material procurement, planning, and scheduling of an appropriate permanent repair or replacement of the defective piping, considering the impact on system availability, maintenance rule applicability, and availability of replacement materials. The licensee states that without its proposed alternative, compliance with the specified requirements of IWA-4000 would result in hardship and/or unusual difficulty, including higher risk associated with plant shut-downs and extended technical specifications actions, without a compensating increase in the level of quality and safety. Therefore, the licensee is proposing the alternative pursuant to 10 CFR 50.55a(z)(2) on the basis that compliance with the specified requirements would result in hardship and/or unusual difficulty without a compensating increase in the level of quality and safety.

3.5 Licensee's Proposed Alternative and Basis for Use

Pursuant to 10 CFR 50.55a(z)(2), the licensee proposes to implement the requirements of Code Case N-789-1 as an alternative to the requirements for IWA-4000 for the temporary repair of degradation in Class 2 and 3 moderate energy raw water piping systems resulting from mechanisms such as erosion, corrosion, cavitation, or pitting, but excluding conditions involving flow accelerated corrosion (FAC), corrosion assisted cracking, or any other form of cracking. ASME Code Case N-789-1 provides provisions for the application of a metal reinforcing pad (pressure pad and structural pad) welded to the exterior of the piping system.

The license stated that sections 1, 3, 5, and 6 of the Code Case specify that materials, design, installation, and examination of reinforcement pads shall be performed in accordance with the construction code or ASME BPV Code, Section III. As allowed by IWA-4200 and IWA-4411, later editions and addenda of the construction code or ASME BPV Code, Section III, may be used, provided any required reconciliations are performed. The licensee clarified that it will only use editions/addenda of ASME BPV Code, Section III, that have been approved by the NRC in 10 CFR 50.55a.

The key requirements of Code Case N-789-1, including the licensee's clarifications and alternatives to the Code Case, are summarized below.

3.5.1 General Requirements

Application of the reinforcing pad shall be performed in accordance with a Repair Replacement Plan satisfying the requirements of IWA-4150. The design, materials, and installation shall meet the requirements of the construction code and IWA-4000, except as stated in the Code Case.

If the minimum required thickness of reinforcing pad necessary to satisfy the requirements of Section 3 of the Code Case is greater than the nominal thickness for the size and schedule of the piping, this Code Case shall not be used. Additional reinforcement or repair is not permitted on top of an existing reinforcing pad. Reinforcing pads, including those installed during a refueling outage, shall not remain in service beyond the end of the next refueling outage. The

Code Case may only be applied to piping not required to be ultrasonically examined for inservice inspection.

3.5.2 Initial Evaluation

The material beneath the surface to which the reinforcing pad is to be applied and the adjacent area shall be ultrasonically measured to establish the existing wall thickness, including the extent and configuration of degradation to be corrected by the reinforcing pad.

The cause and rate of degradation shall be determined. If the cause is determined to be FAC, or any other form of cracking, this Code Case shall not apply. The extent and rate of degradation in the piping shall be evaluated to ensure that there are no other unacceptable locations within the surrounding area that could affect the integrity of the repaired piping. The dimensions of the surrounding area to be evaluated shall be determined by the licensee, considering the type of degradation present.

3.5.3 Design

Type of Reinforcing Pads

Reinforcing pads may be used for leak prevention only (i.e., pressure pad), or for leak prevention plus structural reinforcement of thinned areas including areas that do, or are expected to, penetrate the piping wall (i.e., structural pad).

Pressure pads are designed to retain pressure and may be used only where the piping is predicted to retain full structural integrity until the next refueling outage, assuming a corrosion rate of either two times the actual measured corrosion rate in that location or four times the estimated maximum corrosion rate for the system. The licensee provided clarification regarding its corrosion rate determination for the pressure pads and stated that its designs of pressure pads will be based on a corrosion rate of two times the actual measured corrosion rate in that location. If a repair must be performed without sufficient time to determine the actual rate of corrosion at the repair location, then the pressure pad design will be based on a corrosion rate that is four times the estimated maximum (worst-case) corrosion rate for the same degradation mechanism in that system.

Structural pads are designed for pressure plus structural reinforcement and may be used where the piping is predicted not to retain full structural integrity until the next refueling outage.

General Design Requirements - Pressure and Structural Pads

The design of reinforcing pads shall be in accordance with the applicable requirements of the construction code or the ASME BPV Code, Section III (NC-3100, ND-3100 and NC-3600, ND-3600, including Appendix II).

The reinforcing pad shall be sized to encompass the unacceptable area with the attachment welds located on adjacent base material of sufficient thickness to accommodate the design stresses. The thickness of the reinforcing pad shall be sufficient to maintain required thickness until the next refueling outage. The tensile strengths of the plate and weld filler metal for the reinforcing pad shall be at least that specified for the base metal to which it is applied.

The predicted maximum degradation of the reinforced piping until the next refueling outage shall

be included in the design. The predicted degradation of the piping shall be based on in-situ inspection of, and established data for, similar base metals in similar environments. If the reinforcing pad is predicted to become exposed to the raw water, the predicted degradation of the reinforcing pad shall be based upon established data for base metals or weld metals with similar chemical composition to that used for the reinforcing pad.

The following factors shall be included, as applicable, in the design and application of the pad:

1. shrinkage effects, if any, on the piping;
2. stress concentrations caused by installation of the reinforcing pad or resulting from existing and predicted piping internal surface configuration;
3. effects of welding on any interior coating; and
4. added weight of the pad with respect to any design analyses that could be affected.

The licensee stated that Paragraph 3.2(i) of Code Case N-789-1 includes an incorrect reference to NC-2650 for the flexibility analysis associated with Class 2 designs. The licensee stated that the correct reference should be NC-3650 and it will comply with NC-3650, as an alternative to the N-789-1 requirement to use NC-2650.

The licensee also stated that when gasket material is used in accordance with paragraph 3.2(l) of Code Case N-789-1 (water-backed applications), it will also require removal of any residual moisture by heating prior to welding.

Specific Design Requirements - Pressure Pad

Fillet-welded pressure pads shall be designed to withstand the membrane strain of the piping in accordance with the requirements of paragraph 3.2(a) of Code Case N-789-1 such that the following criteria are satisfied:

1. The allowable membrane stress is not exceeded in the piping or the pad; and
2. The strain in the pad does not result in fillet weld stresses exceeding allowable stresses for such welds.

Pressure pads, designed as a reinforced opening in accordance with the construction code, shall satisfy the aforementioned requirement. Pressure pads may be designed as structural pads in accordance with Section 3.4 of Code Case N-789-1 or as prequalified designs in accordance with Section 3.5 of Code Case N-789-1.

Specific Design Requirements - Structural Pad

Structural pads shall meet the requirements of Section 3.2, Figure 1, of Code Case N-789-1 and the following:

Unless otherwise established by analysis in accordance with the requirements of Section 3.2(a) of Code Case N-789-1, structural pads shall be attached by partial penetration attachment welds that extend for a distance of at least "*s*" in each direction beyond the area predicted, by the next refueling outage, to infringe upon the required thickness.

The thickness of the partial penetration attachment welds shall equal the thickness of the pad and the edges of the welds shall be tapered to the piping surface at a maximum angle of 45 degrees. Final configuration of the structural pad including attachment welds shall permit the

examinations and evaluations required herein, including any required preservice or inservice examinations of encompassed or adjacent welds. Except for the tapered edges, the structural pad plate and attachment welds shall have a uniform thickness.

Prequalified Design

Application of structural pads on straight pipe, standard elbows, and associated welds shall be exempt from the requirements of Section 3.2(a) of Code Case N-789-1, provided all of the following conditions are satisfied:

a) All other requirements of Sections 3.1, 3.2, and 3.4 of Code Case N-789-1 are satisfied.

b) The axial length of structural pad plus width of partial penetration attachment welds shall not exceed the greater of 6 inches or the outside diameter of the piping.

c) The finished structural pad shall be circular, oval, or rectangular in shape.

    1. The maximum dimension compensated by a circular structural pad shall not exceed two-thirds of the nominal outside diameter of the piping.
    2. Rectangular structural pads shall be aligned parallel with or perpendicular to the axis of the piping.
    3. For oval structural pads, the end radii shall not be less than 0.75 $\sqrt{Rt_{nom}}$, and the axis of the structural pad shall be aligned parallel with or perpendicular to the axis of the piping.

3.5.4 Water-Back Applications

Attachment welds on water-backed piping shall be applied using the shielded metal arc welding process with low-hydrogen electrodes. When welding a reinforcing pad to a leaking area, precautions shall be taken to prevent welding on wet surfaces, such as installation of a gasket or sealant beneath the pad. For piping materials other than P-No. 1, Group 1, the surface examination shall be performed no sooner than 48 hours after completion of welding.

3.5.5 Installation

The base material in the area to be welded shall be cleaned to bare metal. Weld metal shall be deposited using a groove-welding procedure qualified in accordance with the ASME BPV Code, Section IX, and the construction code. Provisions for venting during the final closure weld, or for pressurizing for leak-testing, shall be included, if necessary.

3.5.6 Examination

The completed attachment weld shall be examined using the liquid penetrant or magnetic particle method and shall satisfy the surface examination acceptance criteria for welds of the construction code or the ASME BPV Code, Section III (NC-5300, ND-5300).

Except for the tapered edges, partial penetration attachment welds, including the piping base metal upon which they are applied, shall be ultrasonically measured to verify acceptable wall thickness. Partial penetration attachment welds shall be volumetrically examined when full penetration girth welds in the piping are required by the construction code to be volumetrically examined. Where configuration does not permit meaningful volumetric examination, the first

layer, each 1/2 inch thickness of weld deposit, and the final surface shall be examined using liquid penetrant or magnetic particle in lieu of volumetric examination.

If volumetric examination is required, the full volume of the attachment weld, excluding the tapered edges, but including the volume of base metal required for the intended life of the reinforcing pad, shall be examined in accordance with the construction code or the ASME BPV Code, Section III, using either the ultrasonic or radiographic method, and shall, to the depth at the surface of the piping, satisfy the acceptance criteria for weldments of the construction code or the ASME BPV Code, Section III (NC-5320, ND-5320 or NC-5330, ND-5330). Any volume of the piping beneath the reinforcing pad that is credited in the design shall satisfy the volumetric acceptance criteria of the ASME BPV Code, Section III (NC-5320, ND-5320 or NC-5330, ND-5330), as applicable.

3.5.7 Pressure Testing

In lieu of the ASME BPV Code, Section XI, IWA-4540, a system leakage test of the repair/replacement activity shall be performed in accordance with IWA-5000 prior to, or as part of, returning to service. Reinforcing pads attached to piping that has not been breached shall be equipped with pressure taps for performance of pressure testing.

3.5.8 Inservice Monitoring

Upon completion of the repair, inspections shall be performed for structural pads, using ultrasonic or direct thickness measurement, to record the thickness of the plate, the thickness at the attachment welds, including the underlying base metal, and to the extent examinable in a 3-inch wide band, surrounding the repair, as a baseline for subsequent monitoring of the repair.

The licensee shall prepare a plan for additional thickness monitoring for structural pads using ultrasonic or direct thickness measurement to verify that minimum design thicknesses, as required by the construction code or the ASME BPV Code, Section III, are maintained until the next refueling outage. The monitoring shall be monthly for the first quarter and the subsequent frequency shall be based on the results of the monitoring activities, but at least quarterly. Provisions shall be made for access to structural pads on buried piping during operation to accomplish these examinations.

The licensee provided clarification regarding its implementation of Paragraph 8(b) [structural pads] of Code Case N-789-1. The licensee stated that it will perform monitoring [thickness measurement] on a monthly basis during the first quarter as required by Code Case N-789-1. The licensee further stated that the subsequent monitoring frequency shall be based on corrosion rates calculated using reductions in thickness since the previous monitoring inspection, but at least quarterly.

Areas containing pressure pads shall be monitored monthly for evidence of leakage. If the areas containing pressure pads are not accessible for direct observation, monitoring shall be accomplished by observation of surrounding areas or ground surface areas above pressure pads on buried piping; or leakage collection systems, if available, shall be monitored.

If the results of the monitoring program identify leakage or indicate that the structural margins required by Section 3 of Code Case N-789-1 will not be maintained until the next refueling outage, the pad will be removed and repair/replacement activities shall be performed prior to

encroaching on the design limits. All reinforcing pads, regardless of when installed, shall be removed no later than the end of the next refueling outage.

3.5.9 Hardship Justification

The licensee stated that the repair and replacement provisions of IWA-4000 cannot always be utilized when degradation or leakage is identified during plant operations. The licensee contends that its proposed alternative permits the installation of a technically sound temporary repair which permits time for evaluation, design, material procurement, planning, and scheduling of an appropriate permanent repair or replacement of defective piping, taking into consideration the impact on system availability, maintenance rule applicability, and the availability of materials. The licensee stated that without the repair option described in its alternative, compliance with IWA-4000 would result in hardship and/or unusual difficulty without a compensating increase in the level of quality and safety such as higher risk associated with plants shut-downs and extended technical specification actions.

The licensee noted that the ASME Board on Nuclear Codes and Standards approved Code Case N-789-1 on November 13, 2013. However, it has not been incorporated into NRC Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1" (ADAMS Accession No. ML13339A689), and thus is not available for application at nuclear power plants without specific NRC approval.

3.6 Duration of Proposed Alternative

The licensee requested use of the proposed alternative for the duration of the ISI intervals identified above in Section 3.2 of this safety evaluation.

The licensee stated that reinforcing pads installed before the end of the 10-year ISI interval will be removed during the next refueling outage after installation, even if that refueling outage occurs after the end of the 10-year ISI interval. In this case, absent detrimental defects or degradation, duration of the proposed alternative would be until the first refueling outage after the end date of the ISI interval for the applicable SNC plant.

3.7 NRC Staff Evaluation

The NRC staff evaluated the adequacy of the proposed alternative in maintaining the structural integrity of the repaired subject piping. The NRC staff focused on the following key elements of the proposed alternative: (1) general requirements; (2) initial evaluation; (3) design requirements; (4) water-back application; (5) installation; (6) examination; (7) pressure testing; (8) inservice monitoring; and (9) hardship justification.

Many requirements specified in Code Case N-789-1 are not discussed in this safety evaluation, but should not be considered as less important. As part of the NRC-approved proposed alternative, all requirements in Code Case N-789-1 must be followed. Any exceptions to Code Case N-789-1 that are approved in this safety evaluation also need to be followed.

3.7.1 General Requirements

The proposed alternative requires the reinforcing pad be applied in accordance with a Repair Replacement Plan satisfying the requirements of the ASME BPV Code, IWA-4150. The design, materials, and installation requirements of the construction code and IWA-4000, except as

stated in Code Case N-789-1, must be satisfied. Limitations in the proposed alternative general requirements ensure repairs permitted under the alternative are temporary and will be repaired during the next outage. Limitations in the proposed alternative also prevent multiple repairs in the same degradation location which would indicate that a licensee's initial assessment was not accurate. Based on the above, the NRC staff finds that the proposed general requirements, including limitations, are acceptable.

3.7.2 Initial Evaluation

The NRC staff reviewed the proposed initial evaluation and finds that: (1) prior to installing the reinforcing pad, the proposed alternative requires that the base metal be ultrasonically examined to determine the cause and rate of degradation, which is necessary to determine if the degradation rate is such that a temporary repair is or is not appropriate and to determine if the degradation mechanism is not compatible with a temporary repair under the requirements of the alternative, such as FAC, corrosion-assisted cracking, or any other form of cracking; and (2) the proposed alternative requires that an initial inspection be performed to determine the extent of condition of the subject piping and to ensure structural integrity of the subject piping in the vicinity of the degraded area. Based on the above, the NRC staff finds that the proposed initial evaluation is acceptable.

3.7.3 Design Requirements

The licensee stated that Paragraph 3.2(i) of Code Case N-789-1 includes an incorrect reference to NC-2650 for the flexibility analysis associated with Class 2 designs. The correct reference should be NC-3650 and the licensee stated that it will comply with NC-3650. The NRC staff finds that the reference to NC-2650 in Paragraph 3.2(i) of Code Case N-789-1 is incorrect and the correct reference is NC-3650, as stated by the licensee. Therefore, the NRC staff finds the licensee's use of NC-3650 in lieu of NC-2650 to be acceptable.

Paragraph 3.2(l) of Code Case N-789-1 states that when permitted by the design, suitable gasket material may be applied inside the pad to prevent moisture during welding. The licensee stated that when applying Paragraph 3.2(l), it will remove any residual moisture by heating prior to welding. The NRC staff finds this acceptable because removal of residual moisture by heating prior to welding aids in preventing welding defects caused by moisture in contact with the weld pool and decreases the possibility of delayed hydrogen cracking.

The NRC staff finds that the reinforcing pads will be designed in accordance with the applicable requirements of the construction code or the ASME BPV Code, Section III (NC-3100, ND-3100, and NC-3600, ND-3600 including Appendix II).

The NRC staff notes that the proposed alternative clearly defined the pressure pads and structural pads such that each type of pad will be applied for specific pipe degradation and purpose.

Code Case N-789-1, paragraph 3.1(a)(1), specifies that a pressure pad is designed with a corrosion rate of either two times the actual measured corrosion rate in that location, or four times the estimated maximum corrosion rate for the system. In the submittal, the licensee provided clarification regarding paragraph 3.1(a)(1) and stated that if a repair must be performed without sufficient time to determine the actual corrosion rate at the repair location, then the pressure pad design will be based on a corrosion rate that is four times the estimated maximum (worst-case) corrosion rate for the same degradation mechanism in that system.

For the structural pad, the corrosion rate will be based on paragraph 3.2(f) of Code Case N-789-1, which requires that the predicted maximum degradation of the reinforced piping until the next refueling outage be included in the design. The predicted degradation of the piping will be based on in-situ inspection of, and established data for, similar base metals in similar environments. The proposed alternative requires that if the reinforcing pad is predicted to become exposed to the raw water, the predicted degradation of the reinforcing pad shall be based upon established data for base metals or weld metals with similar chemical composition to that used for the reinforcing pad.

Code Case N-789-1 does not provide specific corrosion rate determination for the structural pad. It is not clear to the NRC staff that the corrosion rate used in the structural pad design would be bounding, other than the fact that the structural pad will be designed for the duration until the next refueling outage. As a compensatory measure, the proposed alternative requires inservice monitoring to ensure the structural integrity of the repaired pipe using a structural pad. In addition, the proposed repair is limited to a maximum duration of one operating cycle. The NRC staff finds this relatively short duration of application limits the degradation. Further, should the actual corrosion rate exceed the projected corrosion rate during the operating cycle and a leak develop at or around the installed pad, the proposed inservice monitoring will be able to detect such leakage and the operator will be able to take corrective action.

The structural pad will be designed with partial penetration attachment welds that extend for a distance in each direction beyond the area predicted, by the next refueling outage, to infringe upon the required thickness. Final configuration of the structural pad including attachment welds will permit the examinations and evaluations required herein, including any required preservice or inservice examinations of encompassed or adjacent welds. The proposed alternative requires that the thickness of the reinforcing pad will be sufficient to maintain required thickness until the next refueling outage.

Although concerns exist regarding the corrosion rate used in the structural pad design, the NRC staff finds that the proposed alternative will provide reasonable assurance of the structural integrity and leakage integrity of the repaired piping until the next refueling outage because: (1) the structural pad will be designed to maintain required thickness until the next refueling outage; and (2) the proposed alternative requires periodic inservice monitoring, as discussed further in Section 3.7.8 of this safety evaluation. Therefore, the NRC staff finds the aforementioned design requirements to be acceptable.

3.7.4 Water-Backed Applications

The proposed alternative requires the use of the shielded metal arc welding process with low-hydrogen electrodes for the attachment welds on water-backed piping. The proposed alternative further requires precaution be taken when welding a reinforcing pad to a leaking area. For piping materials other than P-No. 1, Group 1, the licensee will perform the surface examination no sooner than 48 hours after completion of welding. The NRC staff notes that waiting 48 hours after welding ensures that if delayed hydrogen cracking were to occur, it would be detected during the surface examination. Therefore, the NRC staff finds the proposed requirements for water-backed application to be acceptable.

3.7.5 Installation

The NRC staff finds that the proposed alternative requires the use a qualified welding procedure in accordance with the ASME BPV Code, Section IX, and the construction code, in addition to requirements specified in Code Case N-789-1. Therefore, the NRC staff finds the proposed installation requirements acceptable.

3.7.6 Examination

The proposed alternative requires a surface examination (liquid penetrant or magnetic particle) and volumetric examination be performed of the pad, weld and base metal after the reinforcing pad is welded to the pipe in accordance with Section III of the ASME BPV Code or the construction code. The NRC staff finds the proposed acceptance examinations follows Section III of the ASME BPV Code and the construction code. Therefore, the NRC staff finds the proposed acceptance examinations to be acceptable.

3.7.7 Pressure Testing

The proposed alternative requires that a system leakage test will be performed in accordance with IWA-5000 prior to, or as part of, returning to the system to service. In addition, reinforcing pads attached to piping that have not been breached shall be equipped with pressure taps for performance of pressure testing. The NRC staff finds that the proposed pressure testing to be acceptable because it is consistent with IWA-5000 of the ASME BPV Code, Section XI.

3.7.8 Inservice Monitoring

For the structural pad, the proposed alternative requires that the pad be examined using ultrasonic or direct thickness measurement, to record the thickness of the plate, the thickness at the attachment welds, including the underlying base metal, and to the extent examinable in a 3-inch wide band, surrounding the repair, as a baseline for subsequent monitoring of the repair. The licensee will monitor the structural pad monthly for the first quarter and the subsequent frequency will be based on the results of the monitoring activities, but at least quarterly.

For the pressure pad, the proposed alternative requires that the areas containing the pad be visually examined monthly for evidence of leakage. If the areas containing the pressure pad are not accessible for direct observation, the licensee will observe surrounding areas or ground surface areas above pressure pads on buried piping; or leakage collection systems, if available.

The licensee stated that if the results of the monitoring program identify leakage or indicate that the structural margins required by Code Case N-789-1 will not be maintained until the next refueling outage, the pad will be removed and repair/replacement activities shall be performed prior to encroaching on the design limits.

The NRC staff finds that the proposed inservice monitoring requirements are acceptable because: (1) the frequency and the examination method are adequate to monitor the structural integrity of the pressure pad and structural pad; and (2) the acceptance criteria for the pressure pad and structural pad are clearly defined and adequate.

3.7.9 Summary

The NRC staff finds that the proposed alternative will provide reasonable assurance of the structural integrity and leak tightness of the repaired cooling water system pipe because: (1) the scope of the application is clearly defined; (2) the pressure pad and structural pad will be designed in accordance with the construction code and ASME BPV Code, Section III, and specific requirements as specified in Code Case N-789-1; (3) the degraded pipe will be examined and evaluated prior to the repair; (4) acceptance examinations will be performed to verify the condition of the repair; (5) the in-service monitoring will be performed to verify the pipe wall thickness and potential degradation; and (6) pressure testing will be performed in accordance with IWA-5000 of the ASME BPV Code, Section XI.

3.8 Hardship Justification

The NRC staff finds that performing a plant shutdown to repair the subject piping would cycle the unit and increase the potential of an unnecessary transient, resulting in undue hardship. Additionally, performing the ASME BPV Code repair during normal operation would challenge the Technical Specification Completion Time and place the plant at higher safety risk than warranted. Therefore, the NRC staff has determined that complying with the ASME BPV Code, Section XI, requirements would result in hardship or unusual difficult without a compensating increase in the level of quality and safety.

4.0 CONCLUSION

As set forth above, the NRC staff determines that the proposed alternative provides reasonable assurance of structural integrity and leak tightness of the subject piping and that complying with the specified ASME BPV 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 staff authorizes the use of the licensee's proposed alternative, GEN-ISI-ALT-2017-02, for the HNP, Units 1 and 2, and FNP, Units 1 and 2, fifth 10-year ISI intervals. If the proposed alternative is applied near the end of the authorized 10-year ISI interval, and the next refueling outage is in the subsequent interval, the licensee is authorized to continue to apply the proposed alternative until the next refueling outage.

The authorization of proposed alternative GEN-ISI-ALT-2017-02 does not imply or infer NRC approval of ASME Code Case N-789-1.

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

Principal Contributor: R. Davis

Date: January 25, 2018

SUBJECT: EDWIN I. HATCH NUCLEAR PLANT, UNITS 1 AND 2, AND JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2 – INSERVICE INSPECTION ALTERNATIVE GEN-ISI-ALT-2017-02, VERSION 1.0, REGARDING THE USE OF ASME CODE CASE N-789-1 (CAC NOS. MF9942, MF9943, MF9944, AND MF9945; EPID L-2017-LLR-0059) DATED JANUARY 25, 2018

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