March 8, 2007

Mr. L. M. Stinson
Vice President
Southern Nuclear Operating
Company, Inc.
Post Office Box 1295
Birmingham, AL 35201-1295

SUBJECT: JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2, AND VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2 - ALTERNATIVE FOR APPLICATION OF PRESSURIZER NOZZLE FULL-STRUCTURAL WELD OVERLAYS (TAC NOS. MD2794, MD2795, MD2796 AND MD2797)

Dear Mr. Stinson:

By letter dated August 10, 2006, as supplemented by letters dated October 20, 2006, January 3, 2007, and February 21, 2007, Southern Nuclear Operating Company, Inc. (the licensee), submitted a proposed alternative to the requirements of Section XI of the American Society of Mechanical Engineers, *Boiler and Pressure Vessel Code* (ASME Code), under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a(a)(3)(i) for the Joseph M. Farley Nuclear Plant, Units 1 and 2 (Farley Units 1 and 2), and the Vogtle Electric Generating Plant, Units 1 and 2 (Vogtle Units 1 and 2). As described in the proposed alternative ISI-GEN-ALT-06-03, the licensee proposed to use a full-structural weld overlay to repair dissimilar metal welds on a contingency and preemptive basis and to treat nearby similar metal welds in the same manner.

The industry has experienced degradation of the Alloy 82/182 weld material which is susceptible to primary water stress corrosion cracking (PWSCC) in the pressurized-water reactor environment. The weld overlay repair is a process by which a PWSCC-resistant weld metal is deposited on the outside surface of the degraded dissimilar metal weld as a new pressure boundary.

In early February 2007, in developing the weld process for the weld overlay repair, the licensee detected cracking in welding test coupons containing high levels of sulfur. To eliminate potential cracking in actual repairs, the licensee proposed to apply an initial layer of low carbon austenitic stainless steel and/or an austenitic nickel alloy on the pressurizer safe end to provide a buffer between the base metal and the alloy 52/152 weld overlay.

Based on the information submitted, the staff concludes that the proposed alternative provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative ISI-GEN-ALT-06-03 is authorized for the repair of the dissimilar metal welds at Farley Units 1 and 2 and Vogtle Units 1 and 2, and for treatment of nearby similar metal welds in the same manner, as requested by the licensee. The effective period of the

proposed alternative for Farley Units 1 and 2 is through November 30, 2007. The effective period of the proposed alternative for Vogtle Units 1 and 2 is through May 30, 2007.

The NRC staff's safety evaluation is enclosed. If you have any questions, please contact Balwant K. Singal at 301-415-3016.

Sincerely,

/RA/

Evangelos C. Marinos, Chief
Plant Licensing Branch 2-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-348, 50-364, 50-424, and 50-425

Enclosure: Safety Evaluation

cc w/encl: See next page

proposed alternative for Farley Units 1 and 2 is through November 30, 2007. The effective period of the proposed alternative for Vogtle Units 1 and 2 is through May 30, 2007.

The NRC staff's safety evaluation is enclosed. If you have any questions, please contact Balwant K. Singal at 301-415-3016.

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

PROPOSED ALTERNATIVE FOR APPLICATION OF PRESSURIZER NOZZLE FULL

STRUCTURAL WELD OVERLAYS - ISI-GEN-ALT-06-03

JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2

VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

DOCKET NOS. 50-348, 50-364, 50-424, AND 50-425

1.0 INTRODUCTION

By letter dated August 10, 2006 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML062220586), as supplemented by letters dated October 20, 2006, January 3, 2007 and February 21, 2007 (ADAMS Accession Nos. ML062960237, ML070040355, and ML070540416 respectively), Southern Nuclear Operating Company, Inc. (the licensee), requested staff review and approval of alternative ISI-GEN-ALT-06-03 to allow the application of full-structural weld overlays (FSWOLs) over the pressurizer nozzle dissimilar metal welds and similar metal welds on a contingency and preemptive basis, for the Joseph M. Farley Nuclear Plant, Units 1 and 2 (Farley Units 1 and 2) and Vogtle Electric Generating Plant, Units 1 and 2 (Vogtle Units 1 and 2). The proposed approach is an alternative to the requirements of the American Society of Mechanical Engineers, *Boiler and Pressure Vessel Code* (ASME Code), Section XI. In the proposed alternative, the dissimilar metal weld joins the ferritic (i.e., carbon steel) pressurizer nozzle to the austenitic stainless steel safe end. The dissimilar metal weld itself is made of nickel-based Alloy 82/182.

The industry has experienced degradation of the Alloy 82/182 weld material which is susceptible to primary water stress corrosion cracking (PWSCC) in the pressurized-water reactor (PWR) environment. The weld overlay repair is a process by which a PWSCC-resistant weld metal is deposited on the outside surface of the degraded dissimilar metal weld as a new pressure boundary.

As a result of the staff's request for additional information, the license revised the original proposed alternative as shown in the August 10, 2006, letter. The revised alternative is presented in the January 3, 2007, letter.

In early February 2007, in developing the weld process for the weld overlay repair, the licensee detected cracking in welding test coupons containing high levels of sulfur. To eliminate potential cracking in actual repairs, the licensee proposed to apply an initial layer of low carbon austenitic stainless steel and/or an austenitic nickel alloy on the pressurizer safe end to provide a buffer between the base metal and the alloy 52/152 weld overlay as shown in the February 21, 2007 submittal.

2.0 REGULATORY EVALUATION

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein.

Pursuant to 10 CFR 50.55a(a)(3), alternatives to requirements may be authorized by the NRC if the licensee demonstrates that: (i) the proposed alternatives provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The Vogtle and Farley units are in their second and third inspection intervals, respectively. The current Code edition and addenda for Vogtle Units 1 and 2 and Farley Units 1 and 2 are ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 1989 edition with no addenda. In addition, as required by 10 CFR 50.55a, ASME Code, Section XI, 1995 through 1996 addenda, is used for Appendix VIII, "Performance Demonstration for Ultrasonic Examinations."

Per 10 CFR 50.55a(g)(4)(iv), the licensee requested approval to use the 2001 edition of ASME Code, Section III and Section XI, with addenda through 2003 for the proposed weld overlay alternative. This is the latest edition and addenda approved by the Nuclear Regulatory Commission (NRC) in 10 CFR 50.55a. The exception is that for ASME Code, Section XI, Appendix VIII, the 2001 edition of Section XI will be used. This exception is based on 10 CFR 50.55a(b)(2)(xxiv) which states, "The use of Appendix VIII and the supplements to Appendix VIII and Article I-3000 of Section XI of the ASME BPV Code, 2002 Addenda through the latest edition and addenda incorporated by reference in Paragraph (b)(2) of this section, is prohibited."

The staff concludes that the licensee may use the 2001 edition of the ASME Code, Section III and Section XI, with addenda through 2003, except as noted below, as part of the proposed alternative because they have been adopted in 10 CFR 50.55a. However, as the licensee recognized, the use of Appendix VIII and the supplements to Appendix VIII and Article I-3000 of

the 2002 edition and 2003 addenda of the ASME Code, Section XI is prohibited per 10 CFR 50.55a(b)(2)(xxiv).

3.0 PROPOSED ALTERNATIVE ISI-GEN-ALT-06-03

3.1 ASME Code Components Affected

Vogtle Unit 1	Vogtle Unit 2
Dissimilar Metal Welds	
11201-V6-002-W17 (Relief)	21201-V6-002-W17 (Relief)
11201-V6-002-W18 (Safety)	21201-V6-002-W18 (Safety)
11201-V6-002-W19 (Safety)	21201-V6-002-W19 (Safety)
11201-V6-002-W20 (Safety)	21201-V6-002-W20 (Safety)
11201-V6-002-W21 (Spray)	21201-V6-002-W21 (Spray)
11201-V6-002-W22 (Surge)	21201-V6-002-W22 (Surge)
Similar Metal Welds	
11201-030-45 (Spray)	21201-030-49 (Spray)
11201-053-6 (Surge)	21201-053-6 (Surge)
11201-056-1 (Safety)	21201-056-1 (Safety)
11201-057-1 (Safety)	21201-057-1 (Safety)
11201-058-1 (Safety)	21201-058-1 (Safety)
11201-059-1 (Relief)	21201-059-1 (Relief)

Farley Unit 1	Farley Unit 2
Dissimilar Metal Welds	
ALA1-4205-35DM (Spray)	APR1-4205-49DM (Spray)
ALA1-4500-6DM (Surge)	APR1-4500-7DM (Surge)
ALA1-4501-1DM (Safety)	APR1-4501-1DM (Safety)
ALA1-4502-1DM (Safety)	APR1-4502-1DM (Safety)
ALA1-4503-1DM (Safety)	APR1-4503-1DM (Safety)
ALA1-4504-1DM (Relief)	APR1-4504-1DM (Relief)
Similar Metal Welds	
ALA1-4205-34 (Spray)	APR1-4205-48 (Spray)
ALA1-4500-5 (Surge)	APR1-4500-6 (Surge)
ALA1-4501-2 (Safety)	APR1-4501-2 (Safety)
ALA1-4502-2 (Safety)	APR1-4502-2 (Safety)
ALA1-4503-2 (Safety)	APR1-4503-2 (Safety)
ALA1-4504-2&3 (Relief)	APR1-4504-2&3 (Relief)

3.2 Applicable Code Edition and Addenda

ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 1989 edition with no addenda is the current applicable ASME Code for Vogtle and Farley units. In addition, as required by 10 CFR 50.55a, ASME Code, Section XI, 1995 edition through 1996 addenda, is used for Appendix VIII, "Performance Demonstration for Ultrasonic Examinations."

However, the licensee requested to use the 2001 edition of the ASME Code, Section III and Section XI, with addenda through 2003 for this proposed alternative, except that Appendix VIII and the supplements to Appendix VIII and Article I-3000 of Section XI of the ASME Code, 2002 and 2003 addenda cannot be used as discussed above.

3.3 Applicable Code Requirements

Subarticle IWA-4110 of ASME Code, Section XI requires that repairs of welds shall be performed in accordance with Article IWA-4000. Subarticle IWA-4300 requires that defects be removed or reduced to an acceptable size.

Currently, pressurizer weld examinations are performed at the Vogtle and Farley nuclear plants using a Risk-Informed Program (Category R-A) that has been approved by the NRC. The examinations performed are the same as those volumetric examinations specified in ASME Code, Section XI, Table IWB-2500-1, Category B-J and B-F. After the installation of the weld overlays, the similar and dissimilar metal welds will no longer be included in the risk-informed ISI population, but will be examined in accordance with this proposed alternative.

3.4 Reason for Request

PWSCC has been identified as a degradation mechanism for Alloy 82/182 welds and weld buttering used in the dissimilar metal welds. While no PWSCC flaws have been detected in Vogtle or Farley piping, there are geometric limitations such that the required examination volume cannot be met, in all cases, with qualified ultrasonic techniques. For Farley Unit 1, Vogtle Unit 1, and Vogtle Unit 2, only the dissimilar metal welds of the surge and spray nozzles on each unit can be examined using a qualified ultrasonic technique. For Farley-2, all six of the dissimilar metal welds can be examined using ultrasonic techniques. The licensee has concluded that the application of an FSWOL over the pressurizer Alloy 82/182 welds is the most appropriate course of action to ensure the integrity of the reactor coolant pressure boundary. In addition, the overlays will be designed to improve the configurations for future examinations.

The licensee proposes the weld overlay alternative because (1) the 1989 Code does not provide rules for the design of weld overlays or for repairs without removal of flaws, and (2) Code Case N-504-2, which has been approved by the NRC for use, does not provide the methodology for overlaying nickel alloy welds joining austenitic and ferritic base materials.

3.5 Duration of the Alternative

Farley Unit 1 is in the third ISI Interval, from December 1, 1997, through November 30, 2007. Farley Unit 2 is in the updated third ISI Interval, from July 30, 2001, through July 29, 2011. As

approved by the NRC on March 20,1997, Farley Unit 2 updated to the latest edition of ASME Code, Section XI concurrently with Farley Unit 1 as of December 1, 2007. Therefore, the proposed alternative applies to both Farley Units through November 30, 2007.

Vogtle Units 1 and 2 are in the second ISI Interval from May 31, 1997, through May 30, 2007. Therefore, the proposed alternative applies to both Vogtle units through May 30, 2007.

3.6 Proposed Alternative and Basis

Farley Unit 1 is scheduled to have preemptive FSWOLs installed during the next refueling outage in the fall of 2007. Ultrasonic examinations of the similar or dissimilar metal welds are not planned prior to the installation of the preemptive FSWOLs.

Farley Unit 2 is scheduled to perform ultrasonic examinations of the dissimilar metal welds during the next refueling outage in the spring of 2007. If unacceptable indications are found in the dissimilar metal welds as a result of the ultrasonic examination performed during the spring 2007 refueling outage, a contingency weld overlay repair will be applied during this refueling outage (see discussion below). If no unacceptable indications are found, Farley Unit 2 will install preemptive FSWOLs during the spring 2010 refueling outage during the Farley Unit 2 updated fourth ISI Interval. Ultrasonic examinations of the dissimilar metal welds are not planned in 2010 prior to the installation of the overlays.

Vogtle Unit 1 is scheduled to have preemptive FSWOLs installed during the next refueling outage in the spring of 2008 in the third ISI interval. Ultrasonic examinations of the similar or dissimilar metal welds are not planned prior to the installation of the preemptive FSWOLs.

Vogtle Unit 2 is scheduled to have preemptive FSWOLs installed during the next refueling outage in the spring of 2007. Ultrasonic examinations of the similar or dissimilar metal welds are not planned prior to the installation of the preemptive FSWOLs.

The licensee will perform visual examinations every refueling outage at each site on all of the dissimilar metal welds until they are mitigated by weld overlay. If a through-wall flaw in any of the Farley or Vogtle dissimilar metal welds is detected by a visual examination, the leak will be attributed to PWSCC and an FSWOL will be applied during that refueling outage. The licensee will not perform ultrasonic examinations prior to applying the contingency overlay repair and only the nozzle with the leak will be repaired.

If a PWSCC flaw is detected during the scheduled ultrasonic examination of the dissimilar metal welds at Farley Unit 2, a contingency overlay will be applied in the spring of 2007. An ultrasonic indication will be attributed to PWSCC if the indication is observed in the weld metal and the indication is connected to the inside diameter (ID) surface. If unacceptable ultrasonic indications are detected that are not characterized as PWSCC, and the dissimilar metal weld is accepted for continued service by analytical evaluation, successive examinations will be performed per IWB-2420. Then, a contingency FSWOL will be applied in 2010 to the degraded dissimilar metal weld.

The licensee will apply Alloy 52/152 FSWOLs to pressurizer Alloy 82/182 safe-end welds for each of the Farley and Vogtle Units as noted above. For a preemptive FSWOL application,

there is no known flaw. Therefore, a flaw of 100% through the original wall thickness for the entire circumference will be assumed. If a PWSCC indication is detected during the ultrasonic examination of the Farley Unit 2 pressurizer safe-end welds during the spring 2007 refueling outage, a contingency FSWOL will be applied and the as-found flaw size will be used in the crack growth calculation.

Due to the proximity of the similar metal piping welds adjacent to the dissimilar metal welds, preemptive or contingency overlays of the safe-end welds may preclude the examination of the adjacent similar metal piping weld(s). Therefore, the weld overlay will also be applied to the adjacent similar metal piping welds, as necessary. This is expected to include all adjacent similar metal welds with the possible exception of those on the surge lines, where there may be sufficient separation between the dissimilar metal weld and the similar metal weld to allow examination of the similar metal weld after the dissimilar metal weld is overlaid. At Farley Unit 1, similar metal welds ALA1-4504-2 and ALA1-4504-3 are only a few inches apart. Therefore, both welds may be overlaid along with the dissimilar metal weld, ALA1-4504-1DM. At Farley Unit 2, welds APR1-4504-2 and APR1-4504-3 have a similar configuration and will be treated the same as the Farley Unit 1 welds.

These similar metal welds will not be inspected prior to installing the overlay. The selection and examination of the similar metal weld population is currently performed using an NRC-approved risk-informed application. The risk-informed application uses a failure probability analysis, a probabilistic risk assessment, and an expert panel evaluation to identify the piping components that require examination. The piping components selected for examination are only a small portion of the total population of similar metal welds. However, the basic intent of identifying and repairing flaws before piping integrity is maintained by the risk-informed application. As a final step in the selection process, a statistical model was used to assure that a sufficient number of welds are being examined. The welds adjacent to the dissimilar metal welds were not selected for examination in the risk-informed application, and it is concluded that these adjacent similar metal welds do not need to be examined to maintain an acceptable level of quality and safety. After the overlay is applied, the dissimilar and similar metal welds will be removed from the risk-informed weld population and examined in accordance with the proposed alternative.

In lieu of using the existing IWA-4000 Repair Procedures in the 1989 Section XI, ASME Code, the licensee proposed an alternative for the design, fabrication, pressure testing, and examination of the weld overlays. The alternative will reduce a defect in austenitic nickel alloy welds to an acceptable size by increasing the wall thickness through deposition of a weld overlay. References to ASME Code, Sections III and XI, in this alternative are to the 2001 edition with addenda through 2003 as modified by 10 CFR 50.55a.

4.0 STAFF'S EVALUATION

The methodology and associated requirements for the weld overlay in the proposed alternative are similar to Code Case N-740, "Dissimilar Metal Weld Overlay for Repair of Class 1, 2, and 3 Items Section XI, Division 1," of the ASME Code, Section XI. Code Case N-740 combines the requirements in Code Case N-504-2, "Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping Section XI, Division 1," and N-638-1, "Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW [gas tungsten arc welding] Temper

Bead Technique Section XI, Division 1," for the application of weld overlays. Section 50.55(a) of 10 CFR Part 50 states the requirements governing the use of Code Cases and Regulatory Guide 1.147, which has been incorporated into 10 CFR 50.55(a)(b) by reference, lists all the Code Cases accepted by the NRC. However, Code Case N-740 is not listed in RG 1.147 and has not been accepted for use by the NRC staff. For this relief request, the staff reviewed the proposed alternatives by comparing them to alternatives approved by the staff in Code Cases N-504-2 and N-638-1 which have been incorporated by reference in 10 CFR 50.55a.

4.1 General Requirements

The licensee specified that the maximum area of an individual weld overlay on the ferritic material (i.e., the pressurizer nozzles) shall be no greater than 300 square inches. Code Case N-638-1 limits this area to be no greater than 100 square inches. The staff has previously approved 300 square inches for the weld overlay relief requests at other nuclear power plants (Reference 1). Therefore, the staff finds that the licensee-requested 300-square-inch weld area is acceptable.

The licensee specified that the austenitic nickel alloy weld overlay shall consist of at least two weld layers deposited using an alloy 52/152 filler material having a chromium content of at least 28%. Alternatively, a diluted layer may be credited toward the required thickness, provided that the portion of the layer over the austenitic base material, austenitic filler weld material, and the associated dilution zone from an adjacent ferritic base material contains at least 24% chromium. The chromium content of the deposited weld metal as determined by chemical analysis of the production weld or of a representative coupon taken from a mock-up prepared in accordance with the welding procedure specification for the production weld shall contain at least 24% chromium.

The staff questioned that a weld filler material having a chromium content of 24% may not be as resistant to stress corrosion cracking as the weld material having 28% chromium content when the staff was reviewing Code Case N-740 as part of ASME Code review activities. The ASME Code committee provided test data to support the stress corrosion cracking resistance of the filler material having 24% chromium content (Reference 2) . The staff finds that the test data have demonstrated with reasonable assurance that the first layer of weld overlay having a chromium content of 24% will provide resistance to stress corrosion cracking. Therefore, the staff finds that it is acceptable that a diluted layer of the weld overlay has a minimum chromium content of 24%.

In early February 2007, in developing the weld process for the weld overlay repair, the licensee detected cracking in welding test coupons containing high levels of sulfur. To eliminate potential cracking in repairs in the field, in the February 21, 2007, submittal, the licensee proposed that when components subject to being overlayed contain levels of trace chemicals (e.g. sulfur) that could cause unacceptable indications in the Alloy 52/152 weld, an initial layer of low carbon (0.035% maximum) austenitic stainless steel and/or an austenitic nickel alloy may be applied as a buffer between the base metal and the Alloy 52/152 overlay. This buffer will be considered as a non-credited layer and will provide an acceptable chemical composition so that the FSWOL may be applied on top of the buffer layer.

The licensee considered application of the non-credited buffer layer covered in the proposed alternative in the February 21, 2007, submittal. The licensee stated that there will be no appreciable effect on the performance of ultrasonic examinations if the non-credited buffer layer is applied on the base metal. The buffer layer will not adversely affect the ability of the Alloy 52/152 weld overlay to mitigate the growth of PWSCC in the base metal. The non-credited buffer layer will not be included in the weld overlay thickness requirement of the proposed alternative.

The staff finds that the installation of the non-credited buffer layer on the base metal is acceptable because it does not affect the ability of the Alloy 52/152 weld overlay to mitigate potential PWSCC in the base metal, and to effectively ultrasonically examine the weld overlay.

4.2 Crack Growth Considerations and Design

Section 2, *Crack Growth Considerations and Design*, of the January 3, 2007, submittal provides the requirements for overlay design and the crack growth calculation. For a contingency weld overlay repair, flaw characterization and evaluation will be based on as-found flaw in the original weld. For the preemptive weld overlay, the licensee will assume an initial flaw with a depth of 75 percent and a circumference of 360 degrees in calculating the growth of the postulated flaw because the original weld will not be examined prior to weld overlay.

A preservice volumetric examination will be performed after application of the overlay using an ASME Code, Section XI, Appendix VIII [as implemented through performance demonstration initiative (PDI)] examination procedure. This examination will verify that there is no cracking in the upper 25% of the original weld and base material. The PDI procedure is not qualified to examine the lower 75% of the pipe wall thickness. Therefore, a conservative approach is that a 75% through-wall crack is assumed to exist in the lower 75% of the pipe wall thickness. If no flaws were identified in the upper 25% of the original weld, the flaw depth for crack growth calculation would be 75% through-wall in the original weld. If any crack-like flaws are found during the preservice examination in the upper 25% of the original weld or base metal, an analyzed flaw (the postulated 75% through-wall flaw plus the portion of the as-found flaw in the upper 25%) would be used for the crack growth calculation. For example, if a flaw was found extending 10% of the wall thickness into the upper 25% of the original weld, the analyzed flaw for the crack growth calculation would be 85% through-wall. This flaw would then be evaluated for the intended period of operation for growth by PWSCC and fatigue mechanisms. The staff finds that the addition of the as-found flaw size to the assumed flaw size is conservative in the crack growth calculation.

With respect to the design of the FSWOL, the thickness of the overlay will be the same for preemptive and contingency FSWOLs and is calculated based on the assumption of a through-wall flaw, with a length of 360 degrees in the underlying pipe. The overlay is applied so that the criteria of IWB-3640 of ASME Code, Section XI, are met after the overlay is applied.

The licensee is required to evaluate residual stresses and flaw growth of the repaired weldments to demonstrate that the pressurizer nozzles after the weld overlay installation will perform their intended design function. The licensee agreed to submit a stress analysis report similar to the one required to meet paragraphs g(2) and g(3) in Code Case N-504-2. Calculations shall be performed in accordance with IWB-3640. If the flaw is at or near the

boundary of two different materials, evaluation of flaw growth in both materials is required. The size of all flaws will be projected to the end of the design life of the overlay. The licensee noted that there are no existing flaws in the Farley or Vogtle units that required acceptance by analytical evaluation at this time.

The staff expects the results to show that the postulated crack, including its growth in the nozzles, will not adversely affect the integrity of the overlaid welds. The licensee agreed to submit the evaluations prior to entry into Mode 4 from the refueling outage. The staff finds that the licensee's response is acceptable because it will perform a stress analysis which will be available for staff review.

The staff has approved the pressurizer surge lines at the Farley and Vogtle units for leak-before-break (LBB) application. The staff asked the licensee to confirm that installation of the weld overlay of the pressurizer surge line would not invalidate the original LBB analyses. The licensee agreed to confirm that the original LBB analyses are still valid and the associated acceptance criteria will still be met after the weld overlays are applied. The licensee stated that the confirmation of the validity of the LBB analyses cannot be performed prior to the weld overlay installation because actual weld shrinkage stresses cannot be calculated until after the FSWOLs are installed. The shrinkage stresses will be applied to the piping loads to confirm that the existing LBB analyses is still valid. The licensee added a commitment, paragraph 2(b)4ii, to the proposed alternative requiring that the validity of the LBB analyses be confirmed, which is acceptable to the staff.

4.3 Examination and Inspection

Section 3, *Examination and Inspection*, of the January 3, 2007, submittal identifies the licensee's proposed alternatives for the acceptance, preservice and inservice examinations after the weld overlays are installed.

The licensee does not intend to perform ultrasonic examination of the dissimilar metal welds or similar metal welds at Farley Unit 1 and Vogtle Unit 2 prior to the installation of the overlays. Four of the six welds on each unit have examination coverage less than 50% and for the other two welds that are inspectable the radioactive dose exposure to the examiners is estimated about 0.6 rem per unit (for a total of 1.2 rem). Since the licensee intends to apply full-structural overlays, designed for a worst-case, through-wall flaw that is 360 degrees in circumference, the radioactive dose received from examination of these welds would result in a hardship without a compensating increase in the level of quality and safety.

The licensee will conduct ultrasonic acceptance and preservice examinations of the FSWOLs and base metal to determine if there are any indications in the overlay or if there are indications in the upper 25% of the original weld or base material. The licensee recognized that since they will not perform pre-overlay examinations, pre-existing indications in the upper 25% could close by compressive forces imposed by the weld overlay and thus may not be detected during the preservice examination. Within the next two outages, the licensee will conduct ultrasonic examinations on the weld overlay and the upper 25% of the weld and base material. If there is no evidence of new indications or growth of a pre-identified indication during the second ultrasonic examination, then the overlay will be placed into a population to be examined on a

sample basis in accordance with the inservice schedule specified in the January 3, 2007 submittal.

According to the licensee, in the unlikely event, that at a later time, an indication resumes its growth, the proposed alternatives in the relief request provide sufficient defense-in-depth to ensure structural integrity. First, the overlay material is resistant to PWSCC and if a PWSCC indication grows to the weld overlay interface it is expected to stop growing. Second, the proposed design of the FSWOL assumes a through-wall flaw that is 360 degrees around the circumference. Therefore, structural integrity of the welded joints will continue to be maintained because the overlay serves as the replacement pressure boundary regardless of crack growth beneath the overlay. If there is evidence of crack growth in the upper 25% during the second examination, the overlay will be examined for a third time within the next two refueling outages. This sequence of examinations would be repeated until there was no growth or until a new repair became necessary.

If unacceptable ultrasonic indications are detected that are not characterized as PWSCC, and the weld is accepted for continued service by analytical evaluation, successive examinations will be performed per IWB-2420 of the ASME Code, Section XI.

On the basis of the licensee's response, the staff finds that the licensee's proposed alternatives for the acceptance, preservice and inservice inspections, as documented in the January 3, 2007, letter, are acceptable.

The staff was concerned that the licensee does not plan to conduct ultrasonic or visual examinations on the similar metal welds, which will also be installed with weld overlays, prior to weld overlay installation. The staff asked the licensee to discuss (a) how the structural integrity can be demonstrated for the inner 75 percent of the wall thickness region of the similar metal weld, and (b) whether the design requirements in the proposed alternative are also applicable to the overlaid similar metal welds which have different material properties than the dissimilar metal welds.

Regarding the installation of the FSWOL over the similar metal weld adjacent to the dissimilar metal weld, in letter dated January 3, 2007, the licensee responded that the examination of the similar metal welds is currently performed using an NRC-approved risk-informed application. The risk-informed application uses a failure probability analysis, a probabilistic risk assessment, and an expert panel evaluation to identify the piping components that require examination. By letter dated March 9, 2004, the NRC issued the safety evaluation for the risk-informed program and concluded that, "…the proposed alternative provides an acceptable level of quality and safety." Therefore, these adjacent similar metal welds (including the lower 75% of the weld) do not need to be examined. After the overlay is applied, these welds will be removed from the risk-informed weld population and examined in accordance with the proposed alternative. The licensee stated further that the proposed alternatives in the relief request (such as flaw growth calculations) are not applicable to the overlaid similar metal welds because they are not susceptible to stress corrosion cracking in a PWR water environment.

The staff finds that the licensee provided sufficient technical basis for structural integrity of the similar metal weld with respect to the weld overlay.

As discussed in Section 3.0 of the January 3, 2007, submittal, procedures and personnel for the acceptance, preservice and inservice ultrasonic examinations will be qualified in accordance with Appendix VIII of ASME Code, Section XI. The proposed alternative requires further that the Appendix VIII ultrasonic examinations are implemented through the PDI program. In similar relief requests by other licensees, a comparison of the ultrasonic examination qualified by the PDI program to the requirements in Appendix VIII of the ASME Code was submitted to demonstrate compliance. The staff asked the licensee to clarify why the relief request did not include such a comparison, and whether the ultrasonic examination will be performed to the maximum extent achievable.

In letter dated October 20, 2006, the licensee responded that it intends to use Appendix VIII of the 2001 edition of Section XI for the ultrasonic examination of the weld overlays. The PDI Program Status for Code Compliance and Applicability developed in June 2005 indicates that the PDI Program is in compliance with Appendix VIII, 2001 edition of Section XI as amended and mandated by 10 CFR 50.55a, Final Rule, dated September 14, 2004, and published in the *Federal Register* on October 1, 2004 (69 FR 58804). Therefore, a comparison is not regarded as necessary. The licensee stated that the ultrasonic examination will be performed to the maximum extent achievable. The staff finds that the licensee has responded satisfactorily with regard to the PDI Program because it will follow ASME Code, Section XI, as required by 10 CFR 50.55a.

4.3.1 Acceptance Examination

As discussed in Section 3(a), *Acceptance Examination of the Overlay*, of the January 3, 2007, submittal, the licensee will perform a surface examination of an installed weld overlay and use the acceptance criteria of NB-5300 of ASME Code, Section III. The ultrasonic examinations of the installed weld overlay will be performed to assure adequate fusion and to detect fabrication defects. The required surface and volume examinations are defined in Figure 1 of the relief request. The acceptance criteria for the ultrasonic examination will be based on IWB-3514-2 of ASME Code, Section XI. Any planar indication found in the FSWOL that is rejected by IWB-3514-2 will be removed. The staff finds that the licensee's alternative is acceptable because removal of an unacceptable indication as determined by IWB-3514-2 is consistent with the staff's position.

The alternative in paragraph 3(a)2 of the January 3, 2007, submittal requires that the weld overlay and the adjacent base material for at least one-half inch from each side of the weld shall be examined using the liquid penetrant method. This requirement is not consistent with Section 4.0(b) of Code Case N-638-1, which requires surface and ultrasonic examination of a band on either side of the overlay with an axial length of at least 1.5 times the component thickness or 5 inches whichever is greater. The staff asked the licensee to discuss whether paragraph 3(a)2 of the proposed alternative satisfies Section 4.0(b) of Code Case N-638-1. In its letter dated October 20, 2006, the licensee responded that the examination requirements of N-638-1 are applicable to cavity type repairs and have been utilized for overlay repairs with NRC approval. The non-destructive examination (NDE) requirements in the relief request are only applicable to the area that would be affected by application of the overlay. Any PWSCC degradation would be in the alloy 82/182 weld or the adjacent heat affected zone (HAZ). Further, the original weld and adjacent base materials have received a radiographic examination prior to initial acceptance during the plant construction. The proposed surface and

volumetric examinations provide adequate assurance that any defects produced by welding of the overlay or by extension of pre-existing defects would be identified. The staff finds that the licensee's response is acceptable because the alternative provides sufficient surface examination and ultrasonic examination of the weld overlay to detect potential defects.

Paragraph 3(a)3iii of the August 10, 2006, submittal requires that any uninspectable volume in the weld overlay be assumed to contain the largest radial planar flaw that could exist within that volume. Occasionally laminations may exist in the weld overlay as an artifact of welding. Lamination tends to occur in the circumferential direction of the pipe and is defined as the "laminar flaw" in the proposed alternative. The angle beams of the ultrasonic examination may not reach certain volume of the weld overlay underneath the lamination. In this case, a worst-case indication is assumed to exist and is evaluated. This assumed flaw shall meet the inservice examination standards of Table IWB-3514-2. Alternatively, the assumed flaw shall be evaluated and shall meet the requirements of IWB-3640. The staff asked the licensee to define the uninspectable volume in the weld overlay and to clarify the examination requirements. In the response dated January 3, 2007, the licensee responded that the proposed alternative has been revised to reflect the following discussion. The only un-inspectable volume addressed in this alternative is the volume under detected laminar indications. The presence of laminar indications may limit angle beam examinations by reflecting sound waves. Any uninspectable volume in the weld overlay beneath a laminar flaw shall be assumed to contain the largest radial planar flaw that could exist within that volume. This assumed flaw shall meet the preservice examination standards of Table IWB-3514-2. In applying the acceptance standards, wall thickness "t_w" shall be the thickness of the weld overlay. Both axial and circumferential planar flaws shall be assumed.

The licensee stated further that if the preservice acceptance criteria of Table IWB-3514-2 are not met, the assumed flaw shall be evaluated and shall meet the requirements of IWB-3640. If the assumed flaw is not acceptable for continued service per IWB-3600, the lamination shall be removed or reduced in area such that the assumed flaw is acceptable.

For repair and replacement activities, ASME Code, Section XI requires that the acceptance standards of Table IWB-3514-2 be followed as a first line of defense against unacceptable indications. Any indications rejected by Table IWB-3514-2 may be accepted by the acceptance criteria of IWB-3640, which require evaluation by analysis. Indications that cannot be accepted by IWB-3640 would be removed. For acceptance examination of the weld overlays, the staff's position has been that any indication rejected by IWB-3514 needs to be removed immediately and cannot be accepted by IWB-3640. The licensee stated that the actual planar flaws detected during the acceptance examination will not be allowed to be accepted by IWB-3640 as stated in paragraph 3(a)4 in the January 3, 2007, submittal.

The staff finds that the worst-case assumed flaw in an uninspectable volume may be accepted by IWB-3640 for the following reasons: (1) The alternative requires that the largest flaw that could exist in the uninspectable volume of the weld overlay will be used in the evaluation if a lamination is found. This is a conservative assumption for an imaginary flaw because there is a probability that the flaw may not exist in the uninspectable volume. (2) If the assumed flaw is rejected by IWB-3640, the lamination will be removed from the weld overlay, even though the flaw may or may not exist in the uninspectable volume. (3) Paragraph 3(a)5 provides additional limitation that the total laminar flaw (i.e., lamination) shall not exceed 10% of the weld surface

area and that no linear dimensions of the laminar flaw area exceed 3.0 inches. These limitations will minimize the size of the uninspectable volume thus minimizing the size of the assumed flaw, if it exists. (4) Industry experience has shown that repairs to welds may lead to future degradation. The repair of an imagery flaw may cause more harm to the integrity of the weld overlay itself than to allow the imagery flaw to remain in service.

The staff finds it is acceptable to allow the licensee to use IWB-3640 to evaluate assumed flaws in the uninspectable volume under laminations in the FSWOLs in accordance with paragraphs 3(a)(5)ii and 3(a)(5)iii of the January 3, 2007, submittal.

4.3.2 Preservice Examination

The alternatives in Section 3(b), *Preservice Inspection*, of the January 3, 2007, submittal requires an ultrasonic examination of the installed weld overlay and the upper (outer) 25 percent of the original pipe wall thickness. The required examination volume is defined in Figure 2 of the relief request. On the basis of the staff's request for additional information, the licensee has clarified the acceptance criteria of the preservice ultrasonic examination in paragraph 3(b)2 of letter dated January 3, 2007 as:

> The preservice examination acceptance standards of Table IWB-3514-2 shall be applied to planar indications in the weld overlay material. If the indication is found acceptable per Table IWB-3514-2 the weld overlay will be placed in service and the inservice schedule and acceptance criteria of Paragraph 3(c) will be followed. In applying the acceptance standards, wall thickness, t_w, shall be the thickness of the weld overlay. Planar flaws not meeting the preservice acceptance standards of Table IWB-3514-2 shall be repaired. Re-examination per IWB-2420 is not required because unacceptable indications will be removed and the volume will be re-welded.

The staff finds that the use of the above acceptance criteria is acceptable because they require any indication rejected by Table IWB-3514-2 to be repaired.

In Regulatory Guide (RG) 1.147, Revision 14, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," the staff imposed a condition on Code Case N-638-1 regarding ultrasonic examination and associated acceptance criteria based on NB-5330 of ASME Code, Section III. The staff asked the licensee whether the acceptance criteria of NB-5330 of ASME Code, Section III for the ultrasonic examination of the weld overlay will be used. In the October 20, 2006, letter, the licensee responded that it will not be able to satisfy the NRC staff imposed condition on Code Case N-638-1 as stated above.

The licensee stated that it did not use Code Case N-638-1 to prepare for weld overlay applications. Code Case N-638-1 (and the temper bead welding techniques in IWA-4600) was written to address repair welds where a defect in piping is excavated and the resulting cavity is filled using a temper bead technique. However, an excavated cavity configuration differs significantly from the weld overlay configuration. The licensee has concluded that the proposed alternative was written to specifically address weld overlays, and not only does it adequately examine the weld overlays, but it provides more appropriate examinations and acceptance criteria than the NRC-imposed position. Conversely, the imposition of ASME Code, Section III acceptance standards to weld overlays is inconsistent with years of NRC precedence and

without justification given the evidence of past NRC approvals and operating experience. The licensee's conclusion is based on the following:

(1) Weld overlays have been used for repair and mitigation of cracking in Boiling Water Reactors since the early 1980s. In Generic Letter (GL) 88-01, "NRC Position on IGSCC in BWR Austenitic Stainless Steel Piping," the NRC approved the use of Section XI acceptance standards for determining the acceptability of installed weld overlays.

(2) Weld overlays for repair of cracks in piping are not addressed by ASME Code, Section III. ASME Code, Section III, utilizes nondestructive examination procedures and techniques with flaw detection capabilities that are well within the practical limits of workmanship standards for welds. These standards are most applicable to volumetric examinations conducted by radiographic examination. Radiography (RT) of weld overlays is not appropriate because of presence of radioactive material in the reactor coolant system and water in the pipes. The acceptance standards are written for a range of fabrication flaws including lack of fusion, incomplete penetration, cracking, slag inclusions, porosity, and concavity. However, experience and fracture mechanics have demonstrated that many of the flaws that are rejected using ASME Code, Section III acceptance standards do not have a significant effect on the structural integrity of the component.

(3) The ultrasonic examinations performed in accordance with the proposed alternative are in accordance with ASME Code, Section XI, Appendix VIII, Supplement 11 as implemented through the PDI. These examinations are considered more sensitive for detection of defects, either from fabrication or service-induced, than either ASME Code, Section III RT or ultrasonic methods. Further, construction type flaws have been included in the PDI qualification sample sets for evaluating procedures and personnel.

The staff finds that it is acceptable that the licensee will not meet the condition imposed on Code Case N-638-1 in RG 1.147, Revision 14 because the licensee has demonstrated that the condition is not applicable to the proposed alternative and that the proposed alternative provides adequate acceptance criteria for the ultrasonic examination based on the requirements of ASME Code, Section XI.

The industry has seen a number of unacceptable defects in recent weld overlay repairs. As a result, the staff requested that the licensee submit the results of the weld overlay examination within 14 days after the completion of the ultrasonic examination. The licensee committed to providing the following information within 14 days after the nondestructive examinations have been completed: (1) the examination results of the weld overlays, (2) a discussion of any repairs to the overlay material and/or base metal and the reason for the repair, and (3) commitment to perform the subsequent inservice examination in accordance with Subarticle Q-4300 of Appendix Q to ASME Code, Section XI. The staff finds that the licensee's commitment is acceptable because it will provide timely information regarding the weld overlay examination for the staff to monitor the quality of the weld overlay installation.

In a letter dated October 20, 2006, the licensee stated that a summary of the examination coverage of each overlay will be developed and available for NRC review prior to plant startup. The evaluation results of postulated flaws in these regions will be completed and will be

included in the outage summary report. The staff finds the licensee's response satisfactory because it will provide evaluation results for staff review prior to plant startup.

4.3.3 Inservice Examination

The alternatives in Section 3(c) of the relief request of the January 3, 2007, submittal, provide requirements for inservice examinations which will be conducted ultrasonically, and the examination volume is defined in Figure 2 of the alternative. The FSWOLs will be ultrasonically examined during the first or second refueling outage following original installation. If a planar indication is detected in the weld overlay during the first ISI examination and is accepted per Table IWB 3514-2, the weld overlay will be re-examined in the future refueling outage(s) per paragraph 3(c)5 of the proposed alternative. Paragraph 3(c)5 specifies that successive ultrasonic examination will be performed if the subject indication shows crack growth, the presence of new indications in the weld overlay, or crack growth in the outer 25% of the base metal. If the first ISI examination after installation shows no indication, no crack growth, or no new cracking in the weld overlay, the subject weld will be placed into a population group for each unit to be examined on a sample basis in the future. The sample basis consisting of 25% of the population of FSWOL will be volumetrically examined once every 10 years.

If an indication, found during the first ISI, is rejected by Table IWB-3514-2, the indication will be evaluated by the analysis of IWB-3600 per paragraph 3(c)3. If the subject indication is found acceptable by IWB-3640, the future ISI schedule will follow paragraph 3(c)5. If the indication is found to be unacceptable per IWB-3640, the weld overlay will be removed immediately in accordance with paragraph 3(c)6.

Paragraph 3(c)(4) of the proposed alternative states that the 25% of weld overlays in the population will be examined once every 10 years. The licensee stated that the population of welds to be examined is based on the plant-specific number of weld overlays. The licensee stated further that the proposed overlays are mitigative structural replacements of the original pipe wall and there are no known indications present. The successive proposed ISI examination schedule is adequate because in the case where cracking is observed re-examination is required within two outages. Any crack growth observed would again require successive examinations within the next two outages. The staff finds that the licensee's alternative for successive examinations as discussed in paragraph 3(c)(4) of the January 3, 2007, submittal is acceptable because the licensee has clarified the population of the number of weld overlays to be examined and the successive examinations.

4.4 Pressure Testing

In Section 4, *Pressure Testing*, of the January 3, 2007, submittal, the licensee commits to performing a system leakage test in accordance with IWA-5000 after a weld overlay is installed. The staff finds this requirement acceptable because it is consistent with the staff's accepted requirements of Code Case N-504-2 (RG 1.147).

4.5 Documentation

In Section 5, *Documentation*, of the January 3, 2007, submittal, the licensee commits to documenting this relief request on ASME Form NIS-2, "Owner's Report For Repairs or

Replacements." The staff finds this alternative acceptable because it is consistent with the staff's accepted requirements of Code Case N-504-2 (RG 1.147).

4.6 Appendix 1- Ambient Temperature Temper Bead Welding

Appendix 1 to the relief request of the January 3, 2007, submittal, provides requirements for ambient temperature temper bead welding. The licensee prepared Appendix 1 based on Code Case N-638-2 which the staff has not yet endorsed in 10 CFR 50.55a. The staff has endorsed Code Case N-638-1. Therefore, the staff evaluated Appendix 1 based on Code Case N-638-1.

4.6.1 General Requirements

Paragraph 1.0(a) of Code Case N-638-1 limits the thickness of the weld overlay not to exceed 50% of the ferritic base metal thickness. The staff asked the licensee why this requirement is not included in Appendix 1 to the proposed alternative. In the October 20, 2006, letter, the licensee responded that Section 1.0(a) of Code Case N-638-1 applies to the excavation of base metal. It states, "…the depth of the weld shall not be greater than one-half of the ferritic base metal." Therefore, an excavation cannot be made more than one-half of the base metal thickness. The proposed alternative applies to a weld overlay, not an excavation; therefore, the requirement is not applicable. The staff finds the licensee's response acceptable because the limitation of the weld overlay thickness in paragraph 1.0(a) of Code Case N-638-1 is not applicable to the proposed alternative.

4.6.2 Welding Qualifications

Paragraph 2(g) of Appendix 1 provides requirements for the case when the average lateral expansion value of the heat affected zone (HAZ) of Charpy V-notch specimens is less than the average value for the unaffected base metal. This requirement is not included in Code Case N-638-1. The staff requested the licensee to provide a technical basis of this requirement. In the October 20, 2006, letter, the licensee provided the technical basis, which shows that the requirements for the average lateral expansion value of the HAZ of the Charpy V-notch specimens are consistent with Subarticle NB-4330 of the ASME Code, Section III, and Subarticles IWA-4620 and IWA-4630 of the ASME Code, Section XI.

The staff reviewed the licensee's justification and finds that the proposed alternatives in Paragraph 2.1(g) of Appendix 1 are acceptable because the requirements are consistent with the requirements of ASME Code, Section III, NB-4330, and Section XI, IWA-4620 and IWA-4630.

4.6.3 Welding Procedure Requirements

Paragraph 3.0(c) of Appendix 1 of letter dated January 3, 2007, requires the heat input of the first three layers not to exceed 45,000 Joule/inch under any conditions. The staff asked why this requirement is needed because it is not shown in Code Case N-638-1. In the October 20, 2006 letter, the licensee responded that the selected heat input is needed to assure that the transformation product is martensite, which is subsequently tempered. The tempered martensite provides desirable impact strength (notch toughness) in material. The staff finds this requirement acceptable because the limitation imposed on the welding heat input will

assure the existence of tempered martensite in the weld material to improve the impact strength of the weld material.

Paragraph 3(d) of Appendix 1 states that the interpass temperature limitation of QW-406.3 of ASME Code, Section IX, does not need to be applied. QW-406.3 specifies that "...An increase of more than 100°F in the maximum interpass temperature [shall be] recorded on the PQR [procedure qualification record]. This limitation does not apply when a WPS [welding procedure specification] is qualified with a PWHT [post-weld heat treatment] above the upper transformation temperature or when an austenitic material is solution annealed after welding..." This limitation is not specified in the corresponding Section 3.0(d) of Code Case N-638-1. The staff asked the licensee to clarify this difference. In the October 20, 2006, letter, the licensee responded that this clarification was made due to a recent change incorporated in Code Case N-638-2.

The licensee stated that ASME Code, Section IX, QW-256 specifies that the interpass temperature used during production welding shall not be more than 100°F above the interpass temperature used in the procedure qualification. This interpass temperature limitation is a Section IX supplementary essential variable. Code Case N-638 takes exception to this Section IX supplemental essential variable requirement. Paragraph 2.1(e) of Code Case N-638-1 specifies that the maximum interpass temperature for the first three layers of the test assembly in procedure qualification shall not exceed 150°F. Paragraph 3.0(d) of Code Case N-638-1 specifies that the maximum interpass temperature of the welding procedure shall be 350°F regardless of the interpass temperature during qualification.

Paragraph 2.1(e) of Code Case N-638-1 limits the interpass temperature to 150°F (maximum) during the procedure qualification. This limitation on interpass temperature was included in the Code Case to ensure that cooling rates obtained during the procedure qualification were more severe than those to be experienced in production welding. In other words, the 150°F (maximum) interpass temperature requirement of paragraph 2.1(e) of Code Case N-638-1 ensures that cooling rates obtained during the procedure qualification are not slower than those achievable during production welding. Additionally, the 350°F maximum interpass temperature requirement of paragraph 3.0(d) of Code Case N-638-1 for field applications allows for slower (i.e. less severe) cooling rates which are helpful in producing more ductile transformation products in the HAZ.

The licensee stated that the proposed change to paragraph 3.0(d) of Code Case N-638-1 [i.e. adding that the interpass temperature limitation of QW-406.3 need not be applied] was made to clarify the intent of the requirement. It does not amend or change the original intent of this requirement.

On the basis of the above explanation, the staff agrees with the licensee that the interpass temperature limitation of QW-406.3 does not need to be applied.

Paragraph 3(e) of Appendix 1 of the January 3, 2007, submittal, requires the interpass temperature be determined by any of the three methods. The staff questioned the acceptability of the requirement because the proposed requirements for the interpass temperature determination are not specified in Code Case N-638-1. The licensee committed to measure the interpass temperature using direct temperature measurement devices. If it is impossible to

measure the weld interpass temperature in this manner, the licensee will use heat flow calculations and mock-up testing in combination as identified in paragraphs 3.0(e)(2) and 3.0(e)(3) of the January 3, 2007, submittal. The staff finds revised paragraph 3.0(e) as shown in the January 3, 2007, letter acceptable.

The licensee has made the following Regulatory Commitments:

- The licensee will confirm that the original LBB analyses are valid and the associated acceptance criteria are met after the weld overlays are applied.

- The licensee will provide the NRC, within 14 days after the completion of the ultrasonic examination of the weld overlay installations, (1) the examination results of the weld overlays, (2) a discussion of any repairs to the overlay material and/or base metal and the reason for repair, and (3) will perform the subsequent ISI in accordance with Q-4300 of Appendix Q to the ASME Code, Section XI.

5.0 CONCLUSION

The staff has reviewed the licensee's submittal and determined that the proposed alternatives will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the staff authorizes the use of the proposed alternative ISI-GEN-ALT-06-03 for the FSWOL of the dissimilar metal welds of the pressurizer nozzles at Farley Units 1 and 2 and Vogtle Units 1 and 2. The effective period of the proposed alternative for Farley Units 1 and 2 is through November 30, 2007. The effective period of the proposed alternative for Vogtle Units 1 and 2 is through May 30, 2007.

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

6.0 REFERENCES

1. Letter dated June 22, 2005, NRC to PPL Susquehanna, LLC, Subject: "Susquehanna Steam Electric Station, Unit 1 - Relief From American Society of Mechanical Engineers, Boiler and Pressure Vessel Code (ASME Code), Section XI, Appendix VIII, Supplement 11, Requirements and Code Cases N-504-2 And N-638 Requirements (TAC NOS. MC2450, MC2451 And MC2594)," ADAMS Accession No. ML051220568.

2. "Topical Report Supporting an Expedited NRC Review of the Content of the Code Case needed for Dissimilar Metal Weld Overlay Repairs," Electric Power Research Institute (EPRI) Final Report, No. 1014351, July 2006.

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