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

July 18, 2009

Mr. Jon A. Franke, Vice President
Crystal River Nuclear Plant (NA1B)
ATTN: Supervisor, Licensing & Regulatory Programs
15760 W. Power Line Street
Crystal River, Florida 34428-6708

SUBJECT: CRYSTAL RIVER NUCLEAR PLANT, UNIT NO. 3 - RELIEF REQUEST 08-002-RR, REVISION 0, USE OF WELD OVERLAY AS AN ALTERNATIVE REPAIR TECHNIQUE (TAC NO. ME0023)

Dear Mr. Franke,

By letter dated October 29, 2008, as supplemented by letter dated March 12, 2009, Florida Power Corporation (the licensee) submitted Relief Request 08-002-RR, Revision 0 proposing an alternative to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code requirements associated with the fourth 10-year inservice inspection (ISI) interval at Crystal River, Unit 3 (CR-3). Specifically, the licensee proposes the use of a preemptive full structural weld overlay to mitigate the potential for primary water stress corrosion cracking susceptibility of the "A" hot leg surge pipe-to-surge nozzle weld at CR-3.

The Nuclear Regulatory Commission (NRC) staff has evaluated the licensee's risk-informed ISI relief request for the fourth 10-year interval. The NRC staff finds that the licensee has satisfactorily demonstrated compliance with risk-informed regulatory guidelines and determined that the proposed alternative will provide an acceptable level of quality and safety. Therefore, pursuant to paragraph 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations*, the NRC staff authorizes the use of Relief Request 08-002-RR for the fourth 10-year ISI interval.

The NRC staff's safety evaluation is enclosed. If you have any questions regarding this matter, please contact Farideh Saba at (301) 415-1447.

Sincerely,

Brenda Mozafari for

Thomas H. Boyce, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-302

Enclosure: Safety Evaluation

cc w/enclosure: Distribution via ListServ

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

CRYSTAL RIVER UNIT 3 – RELIEF REQUEST 08-002-RR, REVISION 0

USE OF WELD OVERLAY AS AN ALTERNATIVE REPAIR TECHNIQUE

FLORIDA POWER CORPORATION

CRYSTAL RIVER NUCLEAR PLANT, UNIT 3

DOCKET NO. 50-302

1.0 INTRODUCTION

By letter dated October 29, 2008, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML083080296) Florida Power Corporation (the licensee) submitted Relief Request 08-002-RR, Revision 0 proposing an alternative to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) requirements associated with the fourth 10-year inservice inspection (ISI) interval at Crystal River Unit 3 (CR-3). Specifically, the licensee proposed the use of a preemptive full structural weld overlay (SWOL) to mitigate the potential for primary water stress corrosion cracking (PWSCC) susceptibility of the dissimilar metal "A" hot leg surge pipe-to-surge nozzle weld at CR-3. By letter dated March 12, 2009, (ADAMS Accession No. ML090760641) the licensee provided its response to the Nuclear Regulatory Commission (NRC) staff's request for additional information (RAI) regarding certain requirements of Relief Request 08-002-RR, Revision 0.

A dissimilar metal weld (DMW) is defined as a butt weld that joins two pieces of metals that are not of the same material. The DMW for the reactor coolant hot leg surge nozzle connects the ferritic steel hot leg surge nozzle to the austenitic stainless steel surge piping. The DMW itself is made of nickel-based Alloy 82/182 material.

The industry has experienced degradation of the Alloy 82/182 weld material because it is susceptible to PWSCC in the pressurized water reactor (PWR) environment. For the proposed alternative, the weld overlay is a process by which a PWSCC-resistant weld metal is deposited on the outside surface of the susceptible material to form a new pressure boundary.

During the 15th refueling outage an SWOL was applied to the "A" hot leg surge pipe-to-nozzle DMW to mitigate the potential for PWSCC. After the installation, the overlay was removed due to rejectable flaws which were detected using ultrasonic testing (UT) examination. For the upcoming 16th refueling outage, an SWOL is scheduled to be applied to this DMW.

2.0 REGULATORY REQUIREMENTS

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 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 the ASME Code, Section XI, "Rules for Inservice Inspection 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), 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein.

Alternatives to the requirements may be authorized or relief granted by the NRC pursuant to 10 CFR 50.55a(a)(3)(i), 10 CFR 50.55a(a)(3)(ii), or 10 CFR 50.55a(g)(6)(i). In proposing alternatives or requests for relief, the licensee must demonstrate that: (1) the proposed alternatives would provide an acceptable level of quality and safety; (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for the facility.

The ASME Code of record for the current, fourth 10-year ISI interval at CR-3, which started in August 2008, is Section XI, 2001 Edition including addenda, through the 2003 Addenda, and the 2001 Edition, no addenda, for Section XI, Appendix VIII.

3.0 PROPOSED ALTERNATIVE REQUEST

3.1 Component Identification

The licensee stated, in letter dated October 29, 2008, that the SWOL would be applied to the "A" hot leg pipe, weld number B4.1.11, surge nozzle buttering and weld number B4.1.12, surge pipe-to-surge nozzle weld.

The "A" hot leg pipe surge nozzle is carbon steel A 105 Grade II (P-No. 1). The buttering and surge pipe-to-nozzle weld are Alloy 82/182 (F-No. 43). The surge piping attached to the "A" leg surge nozzle buttering is wrought seamless austenitic stainless steel, A 376 TP 316 (P-No. 8).

The subject weld is ASME Code Class 1 and is located in the reactor coolant system pressure boundary. The Code examination category is R-A, "Risk-Informed Piping Examinations."

3.2 Applicable Code Requirements

The licensee stated, in letter dated October 29, 2008, that the applicable requirements for which relief is requested are contained in ASME Code Section XI, 2001 Edition, including Addenda through 2003, Sections IWA-4221(c), IWA-4410, IWA-4411, IWA-4411(a), IWA-4411(e), IWA-4412, IWA-4422.2.2(a), IWA-4422.2.2(b), IWA-4600(b), IWA-4600(b)(1), IWA-4610(a), IWA-4611.1(a), IWA-4611.2(a) and IWA-4633.2(d), and ASME Code Section XI, 2001 Edition, no Addenda, Appendix VIII, Supplement 11.

3.3 Licensee's Basis for Relief

Alloy 82/182 DMW metal has shown a propensity for PWSCC degradation, especially in components subjected to higher operating temperatures such as the "A" hot leg surge pipe. The licensee proposes, in letter dated October 29, 2008, that a preemptive SWOL, which is resistant to PWSCC, be applied to the "A" hot leg surge pipe-to-nozzle DMW without prior UT examination of the subject weld.

ASME Code, Section XI, 2001 Edition, no addenda, articles IWA-4120(a) and IWA-4340(a), does not address all of the requirements for this type of repair since UT examination of PWSCC susceptible weld metal will not be performed prior to applying the SWOL and potentially existing defects will not be removed or reduced in size before a weld overlay of the DMW is performed. Also, comprehensive and generically approved criteria are not currently available for application of SWOL repairs to DMWs constructed of Alloy 82/182 weld material for mitigation of potential PWSCC.

In addition, ASME Code Section XI, 2001 Edition, no Addenda, Appendix VIII, Supplement 11, cannot be implemented as written for UT examination of an SWOL repair.

3.4 Proposed Alternative

The licensee is requesting that a full SWOL be designed, applied and examined, as described in Attachments 1, 3 and 4 of the relief request. Non-destructive examination (NDE) performance demonstration initiative (PDI) program modifications are detailed in Attachment 2 of the relief request.

3.4.1 SWOL Design

The licensee stated, in letter dated October 29, 2008, that the SWOL is a full structural overlay and will satisfy all of the structural design requirements of the pipe assuming that no strength is contributed by the pipe. The SWOL will completely cover the existing DMW and the remnants of the previous austenitic weld overlay material remaining on the nozzle/DMW/ pipe surface, and will extend onto the ferritic nozzle and austenitic stainless steel pipe material on each end of the DMW around the entire circumference of the nozzle.

Since the DMW will not be examined prior to applying the SWOL, the licensee has assumed worse case flaws in the existing DMW. Details of the assumptions are found in Attachment 3 of the relief request.

3.4.2 SWOL Welding

SWOL welding will be performed as described in Attachment 1 of the relief request, in letter dated October 29, 2008, using a remote machine gas tungsten-arc welding (GTAW) process and ERNiCrFe-7A (Alloy 52M) weld metal. The SWOL will completely cover the existing DMW, and will extend onto the ferritic nozzle and austenitic stainless steel pipe material on each end of the weld around the entire circumference of the nozzle.

Since the austenitic stainless steel pipe has a relatively high sulfur content that may result in hot cracking if Alloy 52M is welded directly on it, an ER-309L buffer layer with an Alloy 82 bridge to the existing DMW, as described in Attachment 4 of the relief request, will be welded on the stainless steel prior to application of the SWOL.

In order to prevent a low ductility heat affected zone (HAZ) in the ferritic steel nozzle when the SWOL is welded, the temper bead technique, described in Mandatory Appendix I of Attachment 3 of the relief request, will be employed.

3.4.3 SWOL Nondestructive Examination

The licensee states that it will perform all NDE as described in the relief request, in letter dated October 29, 2008, including a surface examination of the area over which the SWOL will be applied and UT and surface examination of the finished SWOL. NDE is described in Attachment 3 of the relief request. The UT qualification will be in accordance with ASME Code Section XI, 2001 Edition, no Addenda, Appendix VIII, Supplement 11 with the alternatives to the PDI program that that is provided in Attachment 2 of the relief request.

3.5 Duration of Proposed Alternative

Relief from the ASME Code requirements for the "A" hot leg surge pipe-to-nozzle SWOL is requested for the duration of the fourth 10-year ISI Interval which began in August 2008.

4.0 NRC STAFF'S EVALUATION

The licensee's Relief Request 08-002-RR, Revision 0, consists of 4 parts: (1) Attachment 1, "Use of Weld Overlay as an Alternative Repair Technique," (2) Attachment 2 "PDI Program Modifications to ASME Code Section XI, Appendix VIII, Supplement 11," (3) Attachment 3, "Alternative Requirements for Dissimilar Metal Weld Overlays," (4) Attachment 4, "Barrier Layer to Prevent Hot Cracking in High Sulfur Stainless Steel," and (5) Attachment 5, "List of Regulatory Commitments."

The NRC staff noted that the present relief request for CR-3, except for the scope of components and the Code of Record, is nearly identical to Relief Request 07-003-RR, Revision 1 for CR-3 which has previously been authorized by the NRC in a safety evaluation dated November 15, 2007, (ADAMS Accession No. ML073030132). The present Relief Request, 08-002-RR, covers only one of the DMWs of the previous relief request, the "A" hot leg pipe surge nozzle DMW.

4.1 SWOL Design Considerations

The design of the SWOL considers the structural design requirements of the SWOL as well as crack growth evaluations of the initial DMW. Complete description of the SWOL design is found in Attachments 1, 3, and 4 of the relief request.

The licensee states that the SWOL is a full structural overlay and will satisfy all of the structural requirements of the pipe for the original DMW. The SWOL will completely cover the existing DMW and the remnants of austenitic weld overlay material remaining on the nozzle/DMW/pipe

surface, and will extend onto the ferritic nozzle and austenitic stainless steel pipe material on each end of the weld around the entire circumference of the nozzle. Postulated DMW flaws for the structural design of the SWOL are assumed to be 100 percent through wall flaws for the entire circumference, and 100 percent through wall axial flaws with length of 1.5 inches or the combined width of the weld plus buttering, whichever is greater.

Crack growth in the original DMW, due to both stress corrosion and fatigue, shall be evaluated. Postulated inside-surface-connected 75 percent through the original wall flaws will be assumed for flaw growth evaluations in both the axial and circumferential directions. The axial flaw length of 1.5 inches or the combined width of the weld plus buttering, whichever is greater, will be assumed, and the circumferential flaw will be assumed to be 360 degrees. Residual stress distributions, including the residual stress effects due to installing and substantially removing the flawed SWOL during the 15th refueling outage, as well as the new SWOL to be installed, will be calculated and included in the design. Any planar flaws detected during the final SWOL acceptance examination will be characterized and flaw growth calculations will be performed using the flaw(s) detected plus the assumed 75 percent through-wall flaws.

The NRC staff finds both the postulated flaw size for SWOL structural design and DMW crack growth considerations acceptable. They are consistent with ASME Code Case N-504-3, "Alternate Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping, Section XI, Division 1," and the provisions of ASME Code, Section XI, Appendix Q, "Weld Overlay Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping."

4.2 Welding

Complete welding requirements are described in Attachments 1, 3, and 4 of the relief request, letter dated October 29, 2008, and in the licensee's letter dated March 12, 2009.

4.2.1 Barrier Layer to Prevent Hot Cracking in High Sulfur Stainless Steel

Industry experience has shown that Alloy 52M is resistant to PWSCC but welding Alloy 52M on high sulfur stainless steel can result in hot cracking. The licensee states that the surge piping wrought seamless austenitic stainless steel, A 376 TP 316, has relatively high sulfur content. In order to prevent hot cracking when Alloy 52M is welded on high sulfur austenitic stainless steel, a single barrier layer of ER309L will be applied starting approximately 3/16-inch from DMW fusion line on the stainless steel pipe and extending on the stainless steel pipe to beyond the end of the overlay. Industry experience has also shown that welding of ER309L on Alloy 182 DMW material may also result in cracking. While Alloy 82 is not resistant to PWSCC, it has not demonstrated sensitivity to higher sulfur concentrations in stainless steel and is compatible with the ER309L and Alloy 182 weld metal. Therefore, Alloy 82 will be deposited extending from approximately 3/16-inch on the DMW side of the fusion line to tie in with the ER309L portion of the barrier weld. Structural credit will not be given for the barrier weld in determining the required minimum overlay thickness.

The NRC staff finds the use of ER309L material as a barrier layer between Alloy 52M and high sulfur austenitic stainless steel, and Alloy 82 material as an interface between the ER309L and the existing Alloy 182 DMW is appropriate. The licensee has supplied copies of the appropriate welding procedure specification and welding procedure qualification for these welds. A review

of these documents by the NRC staff has shown them to be appropriate and acceptable. The NRC staff finds that the use of the barrier layer is acceptable as it is compatible with the piping and weld materials and will not be used to satisfy the minimum required overlay thickness.

4.2.2 SWOL Welding

The SWOL welding will be performed using a remote machine GTAW process using Alloy 52M weld metal. The SWOL will completely cover the existing DMW, and will extend onto the ferritic nozzle and the barrier layer on the austenitic stainless steel pipe material on each end of the weld around the entire circumference of the nozzle. The SWOL will extend to the transition taper of the carbon steel nozzle so that qualified UT examination of the required volume can be performed.

The SWOL filler material that the licensee has chosen, Alloy 52M, is compatible with the other materials on which it is welded and is the industry standard for PWSCC resistant weld materials.

The number of weld deposit layers in the production weld depends upon the chromium content of the weld pass. If in the austenitic filler material weld and the associated dilution zone from an adjacent ferritic base material contain at least 24 percent chromium, it is resistant to PWSCC and can be credited toward the required thickness. The licensee will determine the chromium content of the deposited weld metal by chemical analysis of either the production weld or a representative coupon taken from a mockup prepared in accordance with the Welding Procedure Specification for the production weld. The licensee stated in their response to the NRC staff's RAI, letter dated March 12, 2009, that "A full mockup will be welded with the same materials and processes that will be used to apply the new SWOL at CR-3." The chromium concentration of the weld of either the weld mockup or the production weld must be determined. The first weld pass over the ferritic steel base material that has a minimum chromium concentration of 24 percent can be given credit toward the required thickness.

4.2.3 Temper Bead Welding on Ferritic Steel Base Material

Mandatory Appendix I to Attachment 3 to Relief Request 08-002-RR, Revision 0, contains the licensee's plan for ambient temperature temper bead welding where the SWOL meets the ferritic steel nozzle. ASME Code Case N-638-1, "Similar and dissimilar Metal Welding Using Ambient Temperature Machine Temper Bead Technique Section XI, Division 1," provides requirements for ambient temperature temper bead welding. Code Case N 638-1 has been endorsed by the NRC via Regulatory Guide 1.147, Revision 15, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," with limitations describing UT examination procedures. The major differences between Mandatory Appendix I and Code Case N-638-1 are discussed below.

Section I-1(b) of Mandatory Appendix I in Attachment 3 states that the maximum area of the weld overlay based on the finished surface over the ferritic base material shall be 300 square inches. Code Case N-638-1 allows only 100 square inches over the ferritic base material. Justification for an increased overlay area over ferritic steel is given in Electric Power Research Institute (EPRI) Report 1014351, "Topical Report Supporting Expedited NRC Review of Code Cases for Dissimilar Metal Weld Overlay Repairs, December 2006." The results of the finite element analysis in the EPRI report demonstrate that the stresses of a nozzle with the

500 square-inch weld area will not adversely affect the integrity of the nozzle. Based on a review of the information provided, the staff finds that the 300 square inch weld area limit over the ferritic base metal is acceptable.

Mandatory Appendix I Section I-2.1(c) states that the maximum interpass temperature for the first three layers of the test assembly shall be 150 degrees Fahrenheit (°F) and Section I-3(d) requires the maximum interpass temperature for field applications to be 350 °F regardless of the interpass temperature during qualification. Both of these requirements are consistent with the requirements of the Code Case. However, ASME Code, Section IX, Table QW-256 specifies the maximum interpass temperature as a supplementary essential variable that must be held within 100 °F above that used during procedure qualification. The licensee states that the limitation on the test assembly maximum interpass temperature is to ensure the cooling rates achieved during procedure qualification are more severe (more rapid cooling rates) than those encountered during field welding, and that the higher interpass temperature is permitted during field welding because it would only result in slower cooling rates which could be helpful in producing more ductile transformation products in the ferritic steel heat affected zone (HAZ). The staff agrees the 350 °F maximum interpass temperature may prove beneficial for favorable metallurgical transformation during field applications by producing slower cooling rates, thus finds this temperature difference acceptable.

The licensee states that when repairs are necessary or additional weld metal is required to form the final SWOL contour at locations at least 3/16 inch away from the carbon steel nozzles, manual GTAW using ERNiCrFe7 (Alloy 52) or Alloy 52M will be performed. The staff finds that the distance requirement is sufficient to prevent formation of brittle products in the ferritic base metal HAZ and is acceptable.

The NRC staff finds that the requirements of Enclosure 1 together with Mandatory Appendix I of the alternate request are consistent with the intent of provisions approved in ASME Code Case N 638-1. The staff therefore finds that the proposed alternative provides an acceptable level of quality and safety.

4.3 SWOL Nondestructive Examination

NDE is described in Attachment 3 of the relief request. The UT examination qualification, described in Attachment 2 of the relief request, will be in accordance with ASME Code Section XI, 2001 edition, no Addenda, Appendix VIII, Supplement 11 with the alternatives that are used to comply with the PDI Program, detailed in Attachment 2 of the relief request.

The weld overlay shall be added to the ISI plan and will be ultrasonically examined during the first or second refueling outage following the SWOL application. In no case will the inspection interval be longer than the life of the overlay.

4.3.1 DMW Surface Examination

Liquid penetrant (PT) examination of the entire surface where the SWOL will be deposited will be performed prior to deposition of the SWOL. Indications with major dimensions greater than 1/16 inch shall be removed, reduced in size or repaired in accordance with ASME Code Section XI requirements.

4.3.2 SWOL Acceptance Examination

Section 3(a) of Attachment 3 of the relief request requires PT examinations of installed SWOL and the adjacent base material for at least ½-inch from each side of the weld. The acceptance criteria for the overlay are the requirements NB-5300 of the ASME Code, Section III and those of the adjacent base metal are NB-2500. The PT examination of the completed weld overlay shall be conducted no sooner than 48 hours after completion of the third temper bead layer over the ferritic steel nozzle in order to detect any delayed cracking which may occur in the ferritic base metal. Surface examination is also required of the thermocouple removal areas in accordance with NB-4435(b)(3) of ASME Code.

Paragraph 3(a)(3) of Attachment 3 of the relief request requires UT examinations of the installed SWOL, including the barrier layer, to assure adequate fusion and to detect fabrication defects. Planar flaws detected must meet the requirements of IWB-3514-2. The volume E F G H is defined in Figure 1(b) of Attachment 3 of the relief request and the thickness "t1" is the nominal SWOL thickness. The NRC staff notes that while the thickness "t1," used in conjunction with Table IWB-3514-2 to determine acceptance criteria, is that of the SWOL without the buffer layer, the examination volume E-F-G-H, must also include the buffer layer, as stated in the Conclusions section of Attachment 4.

The relief request requires examination of the weld overlay over ½-inch outside the original DMW: "For planar indications outside this examination volume, the nominal wall thickness shall be "t2" as shown in Figure 1(c) of the relief request for volumes A-E-H-D and F-B-C-G." Volumes A-E-H-D and F-B-C-G shown in Figure 1(c) refer to the portion of the SWOL that are a minimum of one-half inch away from the original weld. The thickness "t2" in Figure 1(c) used in conjunction with Table IWB-3514-2 refers to the nominal wall thickness of the pipe wall plus the overlay thickness. When the "t2" dimension is used, Table IWB-3514-2 accepts larger flaws in this portion of the weld overlay away from the DMW than would be allowed to remain in service if only the weld overlay thickness is used. Since PWSCC is not a concern in the austenitic stainless steel or low alloy ferritic steel base materials and there is no presumptive need to assume flaws in these base metals, if larger flaws are allowed to remain in service in the portion of the weld overlay away from the DMW, the structural integrity of the portion of the weld overlay that covers the original DMW will not be adversely affected. Therefore, the NRC staff finds that the "t2" dimension is an acceptable parameter for the acceptance criteria of ASME Code IWB-3514-2.

The NRC staff finds that the SWOL discuss of acceptance requirements of the relief request adequately address the examination volume and the acceptance criteria. Therefore, the proposed acceptance examination requirements in Paragraph 3(a) of Attachment 3 of the relief request are acceptable.

4.3.3 Preservice Inspection

Section 3(b) of Attachment 3 of the relief request requires a preservice UT examination of the installed SWOL and the outer 25 percent of the original pipe wall thickness. Angle beam UT is to be used to detect planar flaws which might exist or have propagated into the outer 25 percent of the base material. Scanning is to be performed in four directions, directed parallel and

perpendicular to the piping axis. The required UT examination volume A-B-C-D is defined in Figure 2 of Attachment 2 of the relief request. The acceptance standards of ASME Code Table IWB-3514-2 will be used for the SWOL where the wall thickness "tw" in the Table is the SWOL thickness. Planar flaws detected in the outer 25 percent of the base metal (or original weld) during the preservice examination, will be evaluated in accordance with ASME Code IWB 3640.

Paragraph 3(b)(1) of Attachment 3 of the relief request states that any volume in the outer 25 percent of the underlying DMW, as shown in Figure 2, that cannot be inspected will be assumed to contain the largest planar flaw within that volume for flaw growth evaluation.

The requirements of the relief request adequately address examination volume, the acceptance criteria, and the disposition of volumes that cannot be inspected. Therefore, the NRC staff finds that the proposed preservice examination requirements in Paragraph 3(b) of Attachment 3 of the relief request are acceptable.

4.3.4 Inservice Inspection

The examination volume A-B-C-D for inservice inspection is defined in Figure 2 of the relief request and includes the SWOL as well as the outermost 25 percent of the pipe wall. Section 3(c) of Attachment 3 to the relief request requires ultrasonic inservice examinations during the first or second refueling outage following application.

Paragraph 3(c)(4) allows flaws in the SWOL to be accepted by the criteria given in Table IWB 3514-2. If the weld overlay cannot meet these standards, it is required to meet the analysis of IWB-3600, "Analytical Analysis of Flaws." When planar flaw growth or new planar flaws are found, the weld overlay volume will be reexamined during the first or second refueling outage following the discovery of growth or new planar flaws. For SWOL examination volumes with unacceptable indications, the SWOL will be removed.

Paragraph 2(a)(2)(d) in Attachment 3 of the relief request states in that the flaw depth assumed in determining the life of the overlay is the detected flaw depth plus the postulated worst-case flaw depth in the unqualified ultrasonic examination region of the pipe wall thickness. Paragraph 2(a) states that the size of flaws detected or postulated in the original weld will be used to define the life of the SWOL and in no case will the inspection interval be longer that the life of the overlay.

Flaws that are the result of stress corrosion cracking in the SWOL will result in removal of the SWOL and the item will be repaired or replaced. The staff finds this acceptable, as it would only be appropriate to apply criteria of IWB-3600 to flaws that are not caused by stress corrosion cracking, such as fatigue.

The requirements of the relief request adequately address the time between examinations, the examination volume, the acceptance criteria, and the disposition of volumes that cannot be inspected. In addition, the consideration of possible stress corrosion cracking condition in the SWOL assures that the acceptance criteria are appropriate for detected flaws. Therefore, the NRC staff finds that the proposed inservice examination requirements in Paragraph 3(c) of Attachment 3 of the relief request provide an acceptable level of quality and safety.

4.3.5 Performance Demonstration Initiative Program Modifications to Section XI, Appendix VIII, Supplement 11

The PDI program is designed for qualifying equipment, procedures and personnel to examine weld overlays in accordance with the UT criteria of Appendix VIII, Supplement 11. These examinations are considered more sensitive for detecting fabrication and service-induced flaws than the ASME Code Section III radiographic or ultrasonic examination methods since construction-type flaws have been included in the PDI qualification sample sets for evaluating procedures and personnel. The PDI sample sets described in Attachment 2 to the relief request are appropriate to SWOLs and the austenitic stainless steel materials involved in the present relief request. In addition, a distribution flaw dimensions has been added to the sample set to aid in flaw sizing. The NRC staff has evaluated the differences identified in the PDI program with Supplement 11 and concludes that the proposed alternative to Supplement 11 provides an acceptable level of quality and safety.

4.4 Prior SWOL Welding Flaws

The present SWOL relief request is being proposed because a similar repair procedure performed at the 15th refueling outage was unsuccessful. Rejectable flaws were detected in the "A" hot leg surge nozzle SWOL using UT examination resulting its removal. The staff is concerned that the previous SWOL used the same materials and GTAW welding procedures as those being proposed in this relief request. In its RAI response, dated March 12, 2009, the licensee stated that the rejectable flaws were found near the 3 o'clock and 9 o'clock azimuthal positions of the weld and that similar rejectable flaws found in welding mockups simulating the 5G welding position. The licensee stated that the lack of fusion defects detected appear to be due to problems encountered with welding Alloy 52M filler materials in the vertical down progression and that the new weld mockup will be welded with the vertical up weld progression to conclusively show that eliminating the vertical down weld progression will mitigate the problems encountered at the previous SWOL at CR-3. The welding procedure specification reflects this change. The NRC staff finds that these actions are appropriate and acceptable.

4.5 Summary

Based on the above review, the NRC staff concludes that the licensee's proposed use of Relief Request 08-002-RR for the fourth 10-year interval provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the use of alternative is authorized.

5.0 REGULATORY COMMITMENTS

As part of Relief Request 08-002-RR, the licensee made the regulatory commitments in Attachment 5 of October 29, 2008 letter that were superseded by the following regulatory commitments in Enclosure B of March 12, 2009 letter:

Regulatory Commitment	Due Date
NRC will be notified as soon as practical if any cracks are detected that exceed the preservice examination acceptance standards in ASME Code Section XI, Table IWB-3514-2, in accordance with Attachment 5 of the CR-3 to NRC letter dated October 29, 2008 (ADAMS Accession No.ML083080296).	Prior to Mode 4 during restart from Refueling Outage 16, scheduled for Fall 2009, if necessary.
Submit preliminary analysis of the residual stresses and flaw growth of repaired weldment, including crack growth calculations.	Prior to Mode 4 during restart from Refueling Outage 16, scheduled for Fall 2009
After completion of the ultrasonic examination of the weld overlays performed in Refueling Outage 16, submit to the NRC the ultrasonic examination results of the weld overlays and a discussion of any repairs to the overlay material and/or base metal and reason for the repair, in accordance with Attachment 5 of the CR-3 to NRC letter dated October 29, 2008 (ADAMS Accession No. ML083080296).	60 days after completion of the ultrasonic examination of the weld overlays performed in Refueling Outage 16, scheduled for Fall 2009.
Submit analysis of the residual stresses and flaw growth of repaired weldment, including crack growth breaker closure calculations.	60 days after plant restart [output] from Refueling Outage 16, scheduled for Fall 2009.

6.0 CONCLUSIONS

The NRC staff has reviewed the licensee's submittal and determined that Relief Request 08-002-RR, Revision 0 dated October 29, 2008, as supplemented by letter dated March 12, 2009, will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff authorizes the use of the proposed alternatives to ASME Code for the SWOL of the dissimilar metal "A" hot leg surge line weld at CR-3. The effective period of Relief Request 08-002-RR, Revision 0, is the fourth 10-year ISI interval, which began in August 2008. All other ASME Code 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.

Principal Contributor: Jay S. Wallace

Date: July 18, 2009

July 18, 2009

Mr. Jon A. Franke, Vice President
Crystal River Nuclear Plant (NA1B)
ATTN: Supervisor, Licensing & Regulatory Programs
15760 W. Power Line Street
Crystal River, Florida 34428-6708

SUBJECT: CRYSTAL RIVER NUCLEAR PLANT, UNIT NO. 3 - RELIEF REQUEST 08-002-RR, REVISION 0, USE OF WELD OVERLAY AS AN ALTERNATIVE REPAIR TECHNIQUE (TAC NO. ME0023)

Dear Mr. Franke,

By letter dated October 29, 2008, as supplemented by letter dated March 12, 2009, Florida Power Corporation (the licensee) submitted Relief Request 08-002-RR, Revision 0 proposing an alternative to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code requirements associated with the fourth 10-year inservice inspection (ISI) interval at Crystal River, Unit 3 (CR-3). Specifically, the licensee proposes the use of a preemptive full structural weld overlay to mitigate the potential for primary water stress corrosion cracking susceptibility of the "A" hot leg surge pipe-to-surge nozzle weld at CR-3.

The Nuclear Regulatory Commission (NRC) staff has evaluated the licensee's risk-informed ISI relief request for the fourth 10-year interval. The NRC staff finds that the licensee has satisfactorily demonstrated compliance with risk-informed regulatory guidelines and determined that the proposed alternative will provide an acceptable level of quality and safety. Therefore, pursuant to paragraph 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations*, the NRC staff authorizes the use of Relief Request 08-002-RR for the fourth 10-year ISI interval.

The NRC staff's safety evaluation is enclosed. If you have any questions regarding this matter, please contact Farideh Saba at (301) 415-1447.

Sincerely,
/BMozafari for/

Thomas H. Boyce, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-302

Enclosure: Safety Evaluation

cc w/enclosure: Distribution via ListServ

DISTRIBUTION:

PUBLIC	LPL2-2 R/F	RidsNrrPMCrystal River	RidsNrrLACSola
RidsNrrDorlLpl2-2		RidsNrrDciCpnb	RidsOgcRp
RidsRgn2MailCenter		JAdams EDO RII	John Tsao
Jay Wallace		RidsAcrsAcnw_MailCTR	RidsNrrDraApla

ADAMS Accession Number: ML091910378 NRR-028

OFFICE	LPL2-2/PM	LPL2-2/LA	CPNB/BC*	OGC(waiver)	LPL2-2/BC
NAME	FSaba	CSola	TChan	JGiitter*	BMozafari for TBoyce
DATE	07 / 15 /09	07 / 15 /09	05/ 12 /09	03/04/09	07/18/09

* by memorandum **OFFICIAL RECORD COPY**