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

March 19, 2010

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 REQUESTS 09-001-II AND 09-002-II, REVISION 0, AND RELIEF REQUEST 09-003-II, REVISION 1 FOR THE THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN (TAC NOS. ME0905, ME0906, AND ME0907)

Dear Mr. Franke,

By letter dated March 20, 2009, as supplemented by letters dated May 28 and October 26, 2009, Florida Power Corporation (the licensee) submitted Relief Requests (RRs) 09-001-II and 09-002-II, Revision 0 (henceforth, RRs 09-001-II and 09-002-II) and RR 09-003-II, Revision 1 (henceforth, RR 09-003-II), requesting relief from the limited volumetric examinations performed on the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Class 1 and 2 piping and nozzles and the ASME Code Class1 reactor pressure vessel shell during the third 10-year inservice inspection (ISI) interval, which ended on August 13, 2008, at Crystal River, Unit 3 (CR-3).

The Nuclear Regulatory Commission (NRC) staff has evaluated the licensee's above-mentioned submittals and found them acceptable, with exceptions. For RR 09-001-II, pertaining to pressure retaining welds in valve bodies for nominal pipe size 4 inches or larger, specifically for valve body-to-canopy weld B6.6.7, relief is granted provided that the licensee examines the subject valve whenever it becomes accessible in the future. This alternative requirement is being imposed in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(6)(i). Further, the NRC staff recommends that when and if the examination is performed for valve body-to-canopy weld B6.6.7, the volumetric examination include both shear and refracted longitudinal waves that have been shown to provide enhanced detection on the far-side of the austenitic stainless steel welds. However, the licensee's implementation of this recommendation is not a condition on the granting of relief.

For certain stainless steel welds in RRs 09-001-II and 09-002-II, the licensee employed only shear wave techniques from a single accessible side. In order to ensure that the volumetric examination coverage is maximized, it is recommended that the licensee apply both shear and longitudinal wave techniques on the subject welds during their next scheduled inspections for the components contained in RRs 09-001-II and 09-002-II. Likewise, the licensee's implementation of this recommendation is not a condition on the granting of relief.

The NRC staff has determined that based on the volumetric and surface coverage, if applicable, obtained on the subject welds, it is reasonable to conclude that when significant service-induced

degradation has occurred, evidence of it would have been detected by the examinations that were performed. The NRC staff found that the ASME Code examination coverage requirements are impractical for the subject welds listed in RRs 09-001-II, 09-002-II and 09-003-II. Furthermore, the NRC staff determined that imposition of these ASME Code requirements would create undue burden on the licensee and that examinations performed to the extent practical provide reasonable assurance of structural integrity of the subject welds.

Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i), and is in compliance with the requirements of 10 CFR 50.55a with the granting of this relief. The NRC staff has further concluded that granting RRs 09-001-II, 09-002-II, and 09-003-II in accordance with the requirements of 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security, and is otherwise in the public interest given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Therefore, the NRC grants relief to CR-3 for the subject examinations of the components contained in RRs 09-001-II, 09-002-II, and 09-003-II, except valve body-to-canopy weld B6.6.7 in RR 09-001-II, for the third 10-year ISI interval. For valve body-to-canopy weld B6.6.7 in RR 09-001-II, relief is granted provided the licensee examines valve body-to-canopy weld B6.6.7 during any inspection interval in which the subject weld becomes accessible in the future.

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,

Douglas A. Broaddus, Acting 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 REQUESTS 09-001-II AND 09-002-II, REVISION 0

AND RELIEF REQUEST 09-003-II, REVISION 1 FOR THE

THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN

FLORIDA POWER CORPORATION

CRYSTAL RIVER NUCLEAR PLANT, UNIT 3

DOCKET NO. 50-302

1.0 INTRODUCTION

By letter dated March 20, 2009, as supplemented by letter dated May 28, 2009, Florida Power Corporation (the licensee) submitted Relief Requests (RRs) 09-001-II and 09-002-II, Revision 0 (henceforth, RRs 09-001-II and 09-002-II) and RR 09-003-II, Revision 1 (henceforth, RR 09-003-II). The licensee requested relief from the limited volumetric examinations performed on the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Class 1 and 2 piping and nozzles and the ASME Code Class1 reactor pressure vessel shell during the third 10-year inservice inspection (ISI) interval at Crystal River Unit 3 (CR-3). Additionally, by letter dated October 26, 2009, in response to the Nuclear Regulatory Commission (Commission, NRC) staff's request for additional information (RAI), the licensee submitted additional information for RRs 09-001-II, 09-002-II, and 09-003-II.

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.

Furthermore, 10 CFR 50.55a(g)(5)(iii) states that If the licensee has determined that conformance with certain code requirements is impractical for its facility, the licensee shall notify the Commission and submit, as specified in 10 CFR 50.4, information to support the determinations.

Paragraph (g)(5)(iv) of 10 CFR 50.55a states that where an examination requirement by the code or addenda is determined to be impractical by the licensee and is not included in the revised inservice inspection program as permitted by 10 CFR 50.55a(g)(4), the basis for this determination must be demonstrated to the satisfaction of the Commission not later than 12 months after the expiration of the initial 120-month period of operation from start of facility commercial operation and each subsequent 120-month period of operation during which the examination is determined to be impractical.

Pursuant to 10 CFR 50.55a(g)(6)(i), the Commission will evaluate determinations under paragraph (g)(5) of 10 CFR 50.55a that code requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

The ASME Code of record for third 10-year Interval ISI Program at the CR-3, which ended on August 13, 2008, is Section XI 1989 Edition, no Addenda.

3.0 TECHNICAL EVALUATION

In the licensee's response to the NRC staff's RAI, the licensee withdrew part of RR 09-001-II that pertained to volumetric examination of pressure retaining piping welds less than 4-inch nominal pipe size (NPS) in diameter, since volumetric examinations were performed to satisfy a CR-3 augmented program and not ASME Code, Section XI requirements. The licensee completed the ASME Code-required surface examinations on the subject welds. The request for relief from the ASME Code requirements was withdrawn for the following piping welds:

B4.5.62	B4.5.71.3	B4.5.71.4
B4.5.79.4	B4.5.79.5	B4.5.84.2
B4.5.84.4	B.4.151	B4.5.165

Additionally, in the licensee's response to the NRC staff's RAI, the licensee withdrew the relief request associated with several welds included in RR 09-002-II because the licensee determined that: 1) Volumetric examination was performed on certain welds based on an augmented program and the ASME Code did not require volumetric examination (only surface); 2) It was determined that volumetric coverage on Weld C2.1.1070 exceeded the ASME Code minimum requirements; and 3) Certain welds were not selected for subsequent ISI and were not credited in the ASME Code, Section XI, Examination Category C-F-1 sampling population. The withdrawn Examination Category C-F-1 welds are:

C2.1.190	C2.1.192A	C2.1.605	C2.1.625	X121.020
C2.1.1070	C2.1.2136	C2.1.2137	C2.1.2162	C2.1.2164
C2.1.2169	C2.1.2173	C2.1.2174	C2.1.2175	C2.1.2176
C2.1.2199	C2.1.2200	C2.1.2202	C2.1.2238	C2.1.2240

The welds listed above will not be discussed further in this safety evaluation (SE). The attachment to this SE lists each relief request and the status of approval.

The information provided by the licensee in support of the requests for relief from, or alternatives to, ASME Code requirements has been evaluated and the bases for disposition are documented below. For clarity, the licensee's request has been evaluated in several parts according to ASME Code Examination Category, as needed.

3.1 Request for Relief 09-003-II, Revision 1, Part A, ASME Code, Section XI, Examination Category B-A, Items B1.11 and B1.12, Pressure Retaining Welds in Reactor Vessel

ASME Code Requirement

ASME Code, Section XI, Examination Category B-A, Items B1.11 and B1.12 require essentially 100 percent volumetric examination, as defined by ASME Code, Section XI, Figures IWB-2500-1 and -2, respectively, of the length of reactor pressure vessel (RPV) circumferential and longitudinal shell welds. "Essentially 100 percent", as clarified by ASME Code Case N-460, *Alternative Examination Coverage for Class 1 and Class 2 Welds, Division 1, Section XI* is greater than 90 percent coverage of the examination volume, or surface area, as applicable. ASME Code Case N-460 has been approved for use by the NRC in Regulatory Guide 1.147, Revision 15, *Inservice Inspection Code Case Acceptability* (RG 1.147, Revision 15).

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required 100 percent volumetric examination for the RPV circumferential and longitudinal shell welds shown in Table 3.1.1 below.

Table 3.1.1 – ASME Code, Section XI, Examination Category B-A

ASME Code Item	Weld Identifier	Weld Type	ASME Coverage Obtained
B1.11	B1.2.1	RPV Lower Shell-to-Transition Piece Weld	46%
B1.11	B1.2.3	RPV Nozzle Belt Intermediate Shell Weld	90%
B1.11	B1.2.2	RPV Transition Piece-to-Bottom Head Weld	0%
B1.12	B1.1.5	RPV Long Seam at 247 Degrees	88.1%
B1.12	B1.1.6	RPV Long Seam at 67 Degrees	88.1%

Licensee's Basis for Relief Request (as stated)

RPV Lower Shell-to-Transition Piece Weld (B1.2.1)

> The pre-service records reported the examination coverage as "best effort" due to interferences with core guide lugs and flow stabilizer vanes. This weld is located outside of the area of highest irradiation in the reactor vessel.

RPV Nozzle Belt Intermediate Shell Weld (B1.2.3)

> During the Third Ten-Year ISI Interval examination, a total of 90 percent of the weld was examined. The remaining ten percent was not accessible due to scanning interferences with the inlet nozzle openings and the outlet nozzle boss extensions.

RPV Transition Piece-to-Bottom Head Weld (B1.2.2)

> This weld is located below the beltline region and is not subject to the majority of the neutron flux escaping from the core. An evaluation of neutron embrittlement as a potential damage mechanism has been performed with the conclusion that service induced degradation of the transition piece-to-bottom head weld as a result of corrosion, fatigue, nuclear or thermal embrittlement mechanisms is extremely unlikely. The Third Ten-Year ISI Interval volumetric inspections were not able to be performed using modern automated reactor vessel inspection equipment. The implementation of the requirements of Appendix VIII of the ASME Boiler and Pressure Vessel Code, Section XI, 1995 Edition with Editions up to and Addenda through 2000, as modified by the PDI [Performance Demonstration Initiative] program, place stringent controls on the methodology utilized in performing this inspection. Access to the weld from the vessel exterior presents safety and As Low As Reasonably Achievable [(ALARA) radiation exposure] hazards. Access to the weld to perform the inspection from the outside using a manual contact ultrasonic method would require concrete removal in the cavity and suspension of an inspection team between the exterior of the vessel and inside the shield wall by harnesses.

RPV Long Seam Welds at 247 and 67 Degrees (B1.1.5 and B1.1.6)

> The [RPV] long seam welds on the lower head-to-lower shell section are limited by the geometry of the core positioning lugs and the flow stabilizers. The location of the obstructions prevented the scanning head of the inspection tool to achieve required coverage.

Licensee's Proposed Alternative Examination

The licensee did not propose any alternative examinations for the subject welds. However, the licensee's examinations were performed to the maximum extent practical.

NRC Staff Evaluation

The ASME Code requires essentially 100 percent volumetric examination of the entire length of RPV circumferential and longitudinal shell welds. However, for the subject welds at CR-3, complete examinations are restricted by adjacent appurtenances. The RPV would require design modifications to increase the amount of weld volume that can be inspected. Imposing this requirement would place a burden on the licensee.

As shown in technical descriptions and sketches provided by the licensee, the CR-3 RPV design includes core guide lugs, instrumentation, and flow stabilizers that limit the examination of the subject welds. These appurtenances restrict transducer movement during scanning, which limits volumetric coverage for the subject welds. Ultrasonic (UT) examinations were conducted from the interior of the RPV with a remote system using 45-degree shear wave, and 45-degree and 70-degree refracted longitudinal wave transducers applied on the vessel shell. The licensee obtained coverage between 88 percent and 90 percent of the ASME Code-required inspection volumes for three of the five subject welds. For lower shell-to-transition piece weld 1.2.1, the licensee obtained, approximately, 46 percent volumetric coverage. The transition piece-to-bottom head weld B1.2.2 (weld B1.2.2) received no volumetric examinations due to the close proximity of flow stabilizers and incore instrumentation nozzles protruding from the inner surface of the vessel bottom head. Examining weld B1.2.2 from the outer diameter of the vessel was considered, however this would have required design modifications and concrete removal. The examinations were conducted with equipment, procedures and personnel that were qualified to the process outlined in ASME Code, Section XI, Appendix VIII. The licensee did not detect any unacceptable indications for the weld volumes that were examined.

The licensee has shown that it is impractical to meet the ASME Code-required volumetric examination coverage for the subject welds due to the design and proximity of RPV internal fixtures. However, based on the examination volumes that were obtained, along with the full examination of other pressure retaining RPV welds, it is reasonable to conclude that if significant service-induced degradation had occurred, evidence of it would have been detected by the examinations that were performed. Additionally, although the licensee was unable to obtain any coverage for weld B1.2.2, the examinations of the other RPV welds provide reasonable assurance that, if significant service-induced degradation was occurring in weld B1.2.2, evidence of similar degradation would have been detected by the examinations of the other RPV subject welds. Furthermore, the NRC staff determined that the examinations performed to the extent practical on the subject RPV welds provide reasonable assurance of structural integrity of the subject welds.

3.2 Request for Relief 09-003-II, Revision 1, Part B, ASME Code, Section XI, Examination Category B-D, Item B3.90, Full Penetration Welded Nozzles in Vessels

ASME Code Requirement

ASME Code, Section XI, Examination Category B-D, Item B3.90 requires 100 percent volumetric examination, as defined by ASME Code, Section XI, Figures IWB-2500-7(a) through (d), as applicable, of RPV nozzle-to-vessel welds. ASME Code Case N-460, as an alternative approved for use by the NRC in RG 1.147, Revision 15, states that a reduction in examination

coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required 100 percent volumetric examination of RPV outlet nozzle-to-shell welds, B1.4.7A and B1.4.8A.

Licensee's Basis for Relief Request (as stated)

> The outlet nozzle extension geometry has provided the same limitation area during the Pre-service, First Ten-Year ISI Interval, and Second Ten-Year ISI Interval volumetric examinations of these nozzle welds. The boss extension limits the circumferential scan coverage to 26 percent. However, 100 percent of the required weld volume and adjacent base material has received 2 axial angle beam scans from the nozzle bore.

Licensee's Proposed Alternative Examination

The licensee did not propose any alternative examinations for the subject welds. However, the licensee's examinations were performed to the maximum extent practical.

NRC Staff Evaluation

The ASME Code requires 100 percent volumetric examination of ASME Code, Class 1 nozzle-to-vessel welds. However, at CR-3, the design geometry of outlet nozzle-to-shell welds B1.4.7A and B1.4.8A limit UT scans. In order to effectively increase the examination coverage, the subject nozzle-to-vessel welds would require design modification or replacement. This would place a burden on the licensee.

As shown on the sketches and technical descriptions included in the licensee's submittal, examinations of the subject nozzles have been performed to the extent practical with the licensee obtaining aggregate volumetric coverage of 69.8 percent for each weld. The UT examinations on these carbon steel nozzle welds were performed with an automated system from the inside of the RPV, and included scans from the vessel shell and nozzle bore using 15-, 45- and 70-degree longitudinal and 45-degree shear waves, as applicable. These nozzles are of the "set-in" design, which essentially makes the welds concentric rings aligned parallel with the nozzle axes in the through-wall direction of the RPV vessel. In addition, the nozzle boss extensions limit ASME Code-required UT angle beam examinations performed from the shell side. However, the licensee obtained 100 percent coverage of the weld volume from the nozzle bore. The examinations were conducted with equipment, procedures and personnel that were qualified to the process outlined in ASME Code, Section XI, Appendix VIII. No unacceptable indications were noted during any of the examinations.

The licensee has shown that examining the ASME Code-required volumes of the subject nozzle-to-vessel welds is impractical. However, based on the volumetric coverage that was

obtained, it is reasonable to conclude that, if significant service-induced degradation had occurred, evidence of it would have been detected by the examinations that were performed. Furthermore, the NRC staff determined that the examinations performed to the extent practical provide reasonable assurance of structural integrity of the subject welds.

3.3 Request for Relief 09-001-II, Part C, ASME Code, Section XI, Examination Category B-D, Items B3.110, B3.120, B3.130, and B3.140, Full Penetration Welded Nozzles in Vessels

ASME Code Requirement

ASME Code, Section XI, Examination Category B-D, Items B3.110, B3.120, B3.130, and B3.140 require 100 percent volumetric examination, as defined by ASME Code, Section XI, Figures IWB-2500-7(a) through (d), as applicable, of ASME Code, Class 1 pressurizer and steam generator (primary side) nozzle-to-vessel welds and nozzle inside radius sections. ASME Code Case N-460, as an alternative approved for use by the NRC in RG 1.147, Revision 15, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required 100 percent volumetric examinations of the pressurizer and steam generator nozzle welds shown in Table 3.3.1 below.

Table 3.3.1 ASME Code, Section XI, Examination Category B-D

ASME Code Item	Identifier	Weld Type	ASME Coverage Obtained
B3.110	B2.2.1A	Pressurizer Nozzle-to-Head Weld	50%
B3.110	B2.2.2A	Pressurizer Nozzle-to-Head Weld	50%
B3.110	B2.2.3A	Pressurizer Nozzle-to-Head Weld	50%
B3.110	B2.2.4A	Pressurizer Nozzle-to-Head Weld	56%
B3.120	B2.2.1B	Pressurizer Nozzle Inner Radius	42%
B3.120	B2.2.2B	Pressurizer Nozzle Inner Radius	42%
B3.120	B2.2.3B	Pressurizer Nozzle Inner Radius	42%
B3.120	B2.2.4B	Pressurizer Nozzle Inner Radius	48%
B3.130	B3.2.1	Steam Generator Nozzle-to-Head Weld	46%
B3.130	B3.2.2	Steam Generator Nozzle-to-Head Weld	63%
B3.130	B3.2.3	Steam Generator Nozzle-to-Head Weld	50%
B3.130	B3.2.4	Steam Generator Nozzle-to-Head Weld	46%
B3.130	B3.2.5	Steam Generator Nozzle-to-Head Weld	63%
B3.130	B3.2.6	Steam Generator Nozzle-to-Head Weld	49%

Table 3.3.1 ASME Code, Section XI, Examination Category B-D			
ASME Code Item	Identifier	Weld Type	ASME Coverage Obtained
B3.140	B3.2.1.1	Steam Generator Nozzle Inner Radius	61%
B3.140	B3.2.2.1	Steam Generator Nozzle Inner Radius	48%
B3.140	B3.2.3.1	Steam Generator Nozzle Inner Radius	43%
B3.140	B3.2.4.1	Steam Generator Nozzle Inner Radius	61%
B3.140	B3.2.5.1	Steam Generator Nozzle Inner Radius	48%
B3.140	B3.2.6.1	Steam Generator Nozzle Inner Radius	43%

Licensee's Basis for Relief Request (as stated)

Pressurizer Nozzle-to-Head Welds (B2.2.1A, B2.2.2A, B2.2.3A, and B2.2.4A)

> The pressurizer nozzle-to-vessel head welds are accessible only from the head side, based on the nozzle curvature. The scanning surface of the nozzle is perpendicular to the head surface, which prohibits the ultrasonic wave entering the [ASME] Code required examination volume at an angle that will integrate the weld volume for in-service flaws.

Pressurizer Nozzle Inside Radius (B2.2.1B, B2.2.2B, B2.2.3B, and B2.2.4B)

> The pressurizer nozzles inside radii are accessible only from the head side, based on the nozzle curvature. The scanning surface of the nozzle is perpendicular to the head surface, which prohibits the ultrasonic wave entering the [ASME] Code required examination volume at an angle that will integrate the area volume for in-service flaws.

Steam Generator Nozzle-to-Head Welds (B3.2.1, B3.2.2, B3.2.3, B3.2.4, B3.2.5 and B3.2.6)

> The steam generator nozzle-to-vessel head welds are accessible only from the head side, based on the designed nozzle configuration. The proximity of the nozzle radius prevented examination coverage from the nozzle side. Scanning was performed from the nozzle. However, the [UT] waves did not cover the ASME Code required examination volume at an angle that will integrate the weld volume for in-service flaws.

Steam Generator Nozzle Inside Radius (B3.2.1.1, B3.2.2.1, B3.2.3.1, B3.2.4.1 B3.2.5.1 and B3.2.6.1)

> The steam generator nozzles inside radii are accessible only from the head side, based on the designed nozzle configuration. The proximity of the nozzle outer radius prevented examination coverage from the nozzle side. Scanning was performed from the nozzle. However, the [UT] waves did not cover the [ASME]

Code required examination volume at an angle that will integrate the weld volume for in-service flaws.

Licensee's Proposed Alternative Examination

The licensee did not propose any alternative examinations for the subject welds. However, the licensee's examinations were performed to the maximum extent practical.

NRC Staff Evaluation

The ASME Code requires 100 percent UT examination of ASME Code, Class 1 pressurizer and steam generator (primary side) nozzle-to-vessel welds and nozzle inside radius sections. However, the design configurations of the subject nozzle-to-vessel welds, and adjacent appurtenances, limit main access for UT scanning to the head side of the welds only. In order to effectively increase the examination coverage, the nozzle-to-head welds would require design modifications, or replacement. This would place a burden on the licensee.

As shown on the sketches and technical descriptions included in the licensee's submittal, examinations of the subject nozzle-to-vessel welds and nozzle inside radius sections have been completed to the extent practical, with aggregate coverage(s) of between 42 percent and 63 percent of the ASME Code-required volumes. The pressurizer (PZR) and steam generators consist of SA-516, Grade 70, and SA-508, Grade 64, carbon steel, respectively, with stainless steel cladding on the inside surfaces. The nozzle materials are SA-508 and SA-533 Grade B carbon steel. The nozzles' design essentially makes these weld surfaces aligned perpendicular with the nozzle axes. The curvature between the nozzles and the weld surfaces causes contact of the UT probe to be interrupted. In addition, a welded lifting lug and the support skirt on the once-through steam generator (OTSG) design also restricts access to the subject weld examination areas. These design conditions limit ASME Code-required UT angle beam examinations to be performed only from the head side of the welds.

The UT examinations on the pressurizer and steam generator carbon steel nozzle welds included 0-degree longitudinal wave, and 35-, 45-, and 60-degree shear waves from the head side, including most of the volumes of weld and base materials near the inside surface of the vessel, which are typically the highest regions of stress and where one would expect degradation sources to be manifested should they occur. Although UT scans were primarily limited to the head side only, recent studies have found that inspections conducted through carbon steel are equally effective whether the UT waves have only to propagate through the base metal, or have to also propagate through the carbon steel weldment[1]. The examinations were conducted with equipment, procedures and personnel that were qualified to the process outlined in ASME Code, Section XI, Appendix VIII. No unacceptable indications were noted during any of the examinations. Therefore, it is expected that the UT techniques employed would detect structurally significant flaws that might occur on either side of the subject welds due to their fine-grained carbon steel microstructures.

[1] P. G. Heasler, and S. R. Doctor, 1996. Piping Inspection Round Robin, NUREG/CR-5068, PNNL-10475, U. S. Nuclear Regulatory Commission, Washington, DC.

The licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the subject nozzle-to-vessel welds and nozzle inside radius sections due to the nozzle designs and outer diameter surface configurations. However, based on the volumetric coverage obtained for the subject welds, it is reasonable to conclude that if significant service-induced degradation had occurred, evidence of it would have been detected by the examinations that were performed. Furthermore, the NRC staff determined that the examinations performed to the extent practical provide reasonable assurance of structural integrity of the subject welds.

3.4 Request for Relief 09-001-II, Part D, ASME Code, Section XI, Examination Category B-M-1, Item B12.40, Pressure Retaining Welds in Valve Bodies

ASME Code, Section XI, Examination Category B-M-1, Item B12.40 requires essentially 100 percent volumetric examination, as defined by ASME Code, Section XI, Figure IWB-2500-17, of the length of ASME Code, Class 1 pressure retaining welds in valve bodies NPS 4 or larger. "Essentially 100 percent" as clarified by ASME Code Case N-460, is greater than 90 percent coverage of the examination volume, or surface area, as applicable. ASME Code Case N-460 has been approved for use by the NRC in RG 1.147, Revision 15.

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required 100 percent volumetric examination of ASME Code, Class 1 valve body-to-canopy weld B6.6.7.

Licensee's Basis for Relief Request (as stated)

> [UT] examination of the above valve-to-body weld could not be performed due to being inaccessible. The valve would require disassembly for access to the weld. Relief is being sought on the basis that, due to the design of the valve, disassembly of [valve] DHV-3 is required for access to the weld, including the removal of a weld joining the clamp to the yoke holding the upper assembly.

Licensee's Proposed Alternative Examination

The licensee did not propose any alternative examinations for the subject welds. However, the licensee's examinations were performed to the maximum extent practical.

NRC Staff Evaluation

The ASME Code requires 100 percent volumetric examination of ASME Code, Class 1 pressure retaining welds in valve bodies 4-inch NPS or greater. However, the modified valve design configuration and surrounding appurtenances restrict access for UT scanning. In order to effectively increase the examination coverage, the valve body-to-canopy weld would require component disassembly and/or design modification. This would place a burden on the licensee.

In response to leakage history in the bonnet/shaft region, a modification to the subject valve DHV-3 was performed. This modification includes a yoke assembly that is welded to the

valve body, making the ASME Code-required examination of the stainless steel valve body-to-canopy weld B6.6.7 inaccessible. In order to access the subject weld, valve disassembly including removal of a weld joining a clamp to the yoke holding the upper canopy assembly, removal of surrounding components, and reassembly, would be required to access valve body-to-canopy weld B6.6.7.

Prior to the yoke assembly being installed, preservice examination achieved 75 percent of the ASME Code-required volumetric coverage, including 45- and 70-degree shear waves applied from one side of the weld. This volumetric examination was conducted with equipment, procedures and personnel that were qualified to the process outlined in ASME Code, Section XI, Appendix VIII. No unacceptable indications were noted during the preservice examinations. The licensee performs visual VT-2 examinations of this valve during each refueling outage.

The licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the subject valve body-to-canopy weld due to the design configuration. However, based on the preservice volumetric coverage obtained, and visual examinations conducted during each refueling outage, it is reasonable to conclude that if significant service-induced degradation occurs, evidence of it will be detected. Furthermore, the NRC staff determined that the examinations performed provide reasonable assurance of structural integrity of the subject welds. However, in accordance with 10 CFR 50.55a(g)(6)(i), the NRC staff is imposing the alternative requirement that the licensee examine valve body-to-canopy weld B6.6.7 once during any inspection interval in which the subject weld becomes accessible in the future.

3.5 Request for Relief 09-001-II, Part E, ASME Code, Section XI, Examination Category R-A, Item R1.20, Risk Informed Piping Examinations

The examination requirements for the subject piping weld at CR-3 is governed by a Risk-Informed Inservice Inspection (RI-ISI) program that was approved by the NRC in a Safety Evaluation (SE) dated September 20, 2005 (Agencywide Documents Access and Management System Accession No. ML052360028). The RI-ISI program was developed in accordance with Electric Power Research Institute (EPRI) Topical Report TR-112657, Rev. B-A (EPRI TR-112657), "Revised Risk-Informed Inservice Inspection Evaluation Procedure" (January 2000). As part of the NRC-approved program, the licensee has implemented inspection requirements listed in ASME Code Case N-578-1[2], *Risk-Informed Requirements for Class 1, 2 or 3 Piping, Method B, Division 1, Section XI*, with more detailed provisions contained in EPRI TR-112657. The topical report includes a provision for requesting relief from volumetric examinations if 100 percent of the required volumes cannot be examined.

Table 1 of ASME Code Case N-578-1 assigns the Examination Category R-A, Item R1.20, to piping inspection elements not subject to a known damage mechanism. This table requires 100 percent of the examination location volume, as described in ASME Code, Section XI, Figures IWB-2500-8, 9, 10, or 11, as applicable, including an additional ½-inch of base metal adjacent to the ASME Code volume, be completed for selected Class 1 circumferential piping

[2] ASME Code Case N-578-1 has not been approved for use in RG-1.147, Revision 15. Licensees base their RI-ISI inspection sample size and examination methodology on Table 1 of ASME Code Case N-578-1.

welds. ASME Code Case N-460, as an alternative approved for use by the NRC in RG 1.147, Revision 15, states that a reduction in examination coverage due to part geometry or interference for any ASME Code, Class 1 and 2 weld is acceptable provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from 100 percent volumetric examination of ASME Code, Class 1 elbow-to-valve circumferential weld B4.5.108.17.

Licensee's Basis for Relief (as stated)

> [UT] examination of the above pipe weld was limited in coverage due to component configuration and/or immovable physical barriers. It is not possible to perform the ultrasonic examination from both sides of the weld since one side of the weld was not suitable for scanning, based on the scanning surface angle of the component. Therefore, the weld only received a single sided examination or partial single sided examination resulting in less than 90 percent coverage of the required examination volume.

Licensee's Proposed Alternative Examination

The licensee did not propose any alternative examinations for the subject welds. However, the licensee's examinations were performed to the maximum extent practical.

NRC Staff Evaluation

The examination requirements for the subject piping welds at CR-3 are governed by a RI-ISI program that was approved by the NRC in an SER dated September 20, 2005. This program assigns ASME Code, Examination Category R-A, Item R1.20 to piping elements not subject to a known damage mechanism, and requires inspection of 100 percent of the examination location volume for ASME Code, Class 1 circumferential piping welds. However, the elbow-to-valve configuration limits volumetric examination. In order to meet the RI-ISI program volumetric coverage requirements, the subject weld would have to be redesigned and modified.

As shown on the sketches and technical descriptions included in the licensee's submittal, examination of the subject stainless steel elbow-to-stainless steel valve weld has been completed to the extent practical with aggregate volumetric coverage of approximately 50 percent of the ASME Code-required volume. UT personnel, procedures and equipment qualified through the industry's PDI Program were employed, including 45-degree and 70-degree shear wave scans from the accessible sides of the stainless steel weld. Volumetric examinations from the valve side of the weld could not be performed due to the cast material and sloping surface of the valve. In addition, the pipe elbow intrados limited scanning in the circumferential direction. Volumetric examinations were conducted with equipment, procedures and personnel that were qualified to the process outlined in ASME Code, Section XI, Appendix VIII. No recordable flaw indications were observed during these examinations.

The licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the subject piping weld due to ultrasonic access restrictions caused by the elbow-to-valve design. However, based on the coverage obtained, and considering full volumetric coverage on other R-A Category welds, it is reasonable to conclude that if significant service-induced degradation were occurring, evidence of it would have been detected by the examinations that were performed. Furthermore, the NRC staff determined that the examinations performed provide reasonable assurance of structural integrity of the subject welds.

3.5.I Request for Relief 09-002-II, Part F, ASME Code, Section XI, Examination Category C-A, Item C1.10, Pressure Retaining Welds in Pressure Vessels

ASME Code Requirement

ASME Code, Section XI, Examination Category C-A, Item C1.10 requires essentially 100 percent volumetric examination, as defined by ASME Code, Section XI, Figure IWC-2500-1, of the length of circumferential shell welds in ASME Code, Class 2 pressure vessels. "Essentially 100 percent" as clarified by ASME Code Case N-460, is greater than 90 percent coverage of the examination volume, or surface area, as applicable. ASME Code Case N-460 has been approved for use by the NRC in RG 1.147, Revision 15.

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required 100 percent volumetric examination of shell-to-flange weld C1.1.5 on decay heat cooler DHHE-1A.

Licensee's Basis for Relief Request (as stated)

> [UT] examination of the subject weld was limited in coverage due to component configuration and/or immovable physical barriers. It is not possible to perform a 100 percent [UT] examination from both sides of the weld since one side of the weld was not suitable for scanning based on the scanning surface angle of the component (flange). Therefore, the weld only received a single sided examination or partial single sided examination resulting in less than 90 percent coverage of the required examination volume.

Licensee's Proposed Alternative Examination

The licensee did not propose any alternative examinations for the subject welds. However, the licensee's examinations were performed to the maximum extent practical.

NRC Staff Evaluation

The ASME Code requires 100 percent volumetric examination of ASME Code, Class 2 vessel circumferential shell welds. However, for shell-to-flange weld C1.1.5 on the decay heat cooler, complete examinations are limited to the shell side of the weld only. In order to achieve greater volumetric coverage, the decay heat cooler weld would have to be redesigned and modified.

This would place a burden on the licensee, therefore the ASME Code examinations are considered impractical.

As shown on the sketches and technical descriptions included in the licensee's submittal, examinations of shell-to-flange weld C1.1.5 were performed to the extent practical, with the licensee obtaining approximately 42.5 percent of the ASME Code-required volumetric coverage. The base, weld, and flange material is stainless steel, SA-240, TP 304. The licensee examined shell-to-flange weld C1.1.5 from the shell side of the weld using 45-degree and 60-degree shear wave scans to achieve both circumferential and axial coverage along the weld length in areas not limited by the surface angle of the flange. The licensee used nondestructive examination (NDE) techniques and procedures in accordance with the ASME Code, Section XI, Appendix VIII to perform the volumetric examinations. No recordable flaw indications were observed during these examinations.

The licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for shell-to-flange weld C1.1.5 on the decay heat cooler due to the design of this weld. Based on the volumetric coverage obtained, it is reasonable to conclude that, if significant service-induced degradation had occurred, evidence of it would have been detected by the examinations that were performed. Furthermore, the NRC staff determined that the examinations performed provide reasonable assurance of structural integrity of the subject weld.

3.6 Request for Relief 09-002-II, Part G, ASME Code, Section XI, Examination Category C-B, Item C2.21, Pressure Retaining Nozzle Welds in Vessels

ASME Code Requirement

ASME Code, Section XI Examination Category C-B, Item C2.21 requires 100 percent volumetric and surface examinations, as defined by ASME Code, Figure IWC-2500-4(a) or (b), as applicable, of nozzle-to-shell (or head) welds in ASME Code, Class 2 vessels. ASME Code Case N-460, as an alternative approved for use by the NRC in RG 1.147, Revision 15, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required volumetric examination of inlet nozzle-to-shell weld C1.2.3 on the decay heat cooler DHHE-1A.

Licensee's Basis for Relief Request (as stated)

> [UT] examination of the subject weld was limited in coverage due to component configuration and/or immovable physical barriers. It is not possible to perform a 100 percent [UT] examination from both sides of the weld since scanning was performed on the shell side only. The scanning surface of the pipe is perpendicular to the shell surface which prohibits the [UT] wave entering the

> [ASME] Code required examination volume at an angle that will integrate the weld volume for in-service flaws. Therefore, the weld only received a single sided examination or partial single sided examination resulting in less than 90 percent coverage of the required examination volume.

Licensee's Proposed Alternative Examination

The licensee did not propose any alternative examinations for the subject welds. However, the licensee's examinations were performed to the maximum extent practical.

NRC Staff Evaluation

The ASME Code requires 100 percent volumetric and surface examination of Class 2 nozzle-to-shell welds. However, for inlet nozzle-to-shell weld C1.2.3 on the decay heat cooler, complete examination is limited due to the nozzle configuration. In order to achieve greater volumetric coverage, the nozzle and vessel would have to be redesigned and modified. This would place a burden on the licensee, therefore the ASME Code volumetric examination is considered impractical.

As shown on the sketches and technical descriptions included in the licensee's submittal, examination of the decay heat cooler inlet nozzle-to-shell weld C1.2.3 was performed to the extent practical, with the licensee obtaining approximately 45.5 percent of the required examination volume, including 45- and 60-degree shear wave scans from the shell side of the weld. The decay heat cooler is fabricated of stainless steel material with a nominal thickness of 1.25 inches. The nozzle's "set-in" design essentially makes the weld concentric rings aligned parallel with the nozzle axes. For this reason, no scans could be performed from the nozzle side of the weld. The licensee used NDE techniques and procedures qualified in accordance with the ASME Code, Section XI, Appendix VIII to perform the volumetric examinations. The ASME Code-required surface examination was completed with no limitations. No unacceptable indications were noted during the volumetric or surface examinations.

The licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the subject nozzle-to-shell weld due to the nozzle design configuration. However, based on the volumetric and surface coverage obtained, it is reasonable to conclude that, if significant service-induced degradation had occurred, evidence of it would be have been detected by the examinations performed. Furthermore, the NRC staff determined that the examinations performed provide reasonable assurance of structural integrity of the subject welds.

3.7 Request for Relief 09-002-II, Part H, ASME Code, Section XI, Examination Category C-F-1, Items C5.11, C5.21, Pressure Retaining Welds in Austenitic Stainless Steel or High Alloy Piping

ASME Code Requirement

ASME Code, Section XI, Examination Category C-F-1, Items C5.11 and C5.21 require 100 percent volumetric and surface examinations, as defined by ASME Code, Section XI, Figure IWC-2500-7, of selected circumferential ASME Code, Class 2 austenitic stainless steel

or high alloy piping welds. ASME Code Case N-460, as an alternative approved for use by the NRC in RG 1.147, Revision 15, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required volumetric examinations of the piping welds shown in Table 3.9.1 below.

Table 3.8.1 ASME Code, Section XI, Examination Category C-F-1				
ASME Code Item	Weld Identifier	Weld Configuration	Pipe Size - Thickness	ASME Coverage Obtained
C5.11	C2.1.104	Valve-to-Pipe	10" – 1.0"	50%
C5.11	C2.1.1477	Elbow-to-Valve	14" – 0.375"	50%
C5.11	C2.1.163	Valve-to-elbow	14" – 0.375"	50%
C5.11	C2.1.167	Elbow-to-Valve	14" – 0.375"	50%
C5.11	C2.1.170	Pipe-to-Valve	14" – 0.375"	50%
C5.11	C2.1.184	Valve-to-Elbow	12" – 0.375"	50%
C5.11	C2.1.503	Elbow-to-Valve	14" – 0.375"	50%
C5.11	C2.1.507	Flange-to-Reducer	14" – 0.375"	50%
C5.11	C2.1.526	Flange-to-Pipe	10" – 0.365"	50%
C5.11	C2.1.527	Pipe-to-Flange	10" – 0.365"	50%
C5.11	C2.1.542	Reducer-to - valve	14" – 0.375"	50%
C5.11	C2.1.543	Tee-to-Pipe	14" – 0.375"	50%
C5.11	C2.1.548	Elbow-to-Valve	14" – 0.375"	50%
C5.11	C2.1.600	Flange-to-Reducer	18" – 0.375"	50%
C5.21	C2.1.1018	Pipe-to-Valve	3.0" – 0.438"	50%
C5.21	C2.1.1031	Tee-to-Tee	4.0" – 0.531"	50%
C5.21	C2.1.1040	Pipe-to-Valve	2.5" – 0.375"	50%
C5.21	C2.1.1047	Valve-to-Pipe	4.0" - 0.531"	50%
C5.21	C2.1.1060	Tee-to-Elbow	2.5" – 0.375"	87.5%
C5.21	C2.1.1067	Pipe-to-Valve	3.0" – 0.438"	50%
C5.21	C2.1.1084	Valve-to-Reducer	3.0" – 0.438"	50%
C5.21	C2.1.1096	Pipe-to-Valve	4.0" – 0.531"	50%

Table 3.8.1 ASME Code, Section XI, Examination Category C-F-1				
ASME Code Item	Weld Identifier	Weld Configuration	Pipe Size - Thickness	ASME Coverage Obtained
C5.21	C2.1.1097	Valve-to-Pipe	4.0" – 0.531"	50%
C5.21	C2.1.1098	Pipe-to-Tee	4.0" – 0.531"	50%
C5.21	C2.1.1207	Valve-to-Pipe	2.5" – 0.375"	50%
C5.21	C2.1.1223	Valve-to-Pipe	2.5" – 0.375"	50%
C5.21	C2.1.1272	Tee-to-Pipe	2.5" – 0.375"	50%
C5.21	C2.1.2073	Elbow-to-Flange	2.5" – 0.375"	50%
C5.21	C2.1.2078	Elbow-to-Flange	4.0" – 0.237"	50%
C5.21	C2.1.2117	Elbow-to-Pipe	3.0" – 0.438"	80%

Licensee's Basis for Relief Request (as stated)

> [UT] examination of the above pipe welds was limited in coverage due to component configuration and/or immovable physical barriers. It is not possible to perform a 100 percent UT examination from both sides of the weld since one side of the weld was not suitable for scanning based on the scanning surface angle of the component. Therefore, the welds only received a single sided examination or partial single sided examination resulting in less than 90 percent coverage of the required examination volume.

Licensee's Proposed Alternative Examination

The licensee did not propose any alternative examinations for the subject welds. However, the licensee's examinations were performed to the maximum extent practical.

NRC Staff Evaluation

The ASME Code requires 100 percent volumetric and surface examination for selected ASME Code, Section XI, Examination Category C-F-1 pressure retaining circumferential welds in piping. The volumetric examination must be applied from both sides of the weld to maximize coverage. However, volumetric examinations are limited by the geometry of the welds, which restricts scanning to one side only. To gain access for examination, the welds would require design modifications. Imposition of this requirement would create a burden on the licensee.

As shown on the sketches and technical descriptions included in the licensee's submittal, examinations of the subject welds have been performed to the extent practical with the licensee obtaining volumetric coverage ranging from 50 percent to 87.5 percent. Access for examination of the subject piping welds is limited to the pipe or elbow side only due to the surface angle caused by the valve-to-elbow, valve-to-pipe, flange-to-pipe, flange-to-reducer, or tee-to-pipe weld configurations (see Table 3.9.1 above). The ultrasonic methods employed for these stainless steel welds have been qualified through the industry's PDI Program, which meets

ASME Code, Section XI, Appendix VIII requirements. These methods have been qualified for flaws located on the near-side of the welds; far-side detection of flaws is considered to be a "best effort." For this reason, the licensee has taken credit for completing only 50 percent of the ASME Code-required inspection volume on most of the subject piping welds.

Depending on the piping wall thickness (see Table 3.9.1 above), the licensee's ultrasonic methods included 45-degree, and 60-degree shear waves, and 70-degree refracted longitudinal waves (L-waves), which have been shown to provide enhanced detection on the far-side of austenitic stainless steel welds[3,4]. While the licensee has only taken credit for obtaining 50 percent volumetric coverage for the majority of the subject piping welds, the techniques employed would have provided coverage beyond the near-side of the welds. A review of the typical weld cross-sectional information indicates that limited volumetric coverage on the far-side of the welds has been obtained by the licensee. The licensee completed the ASME Code-required surface examinations on these welds. No recordable indications were noted during the performance of these examinations.

The licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the subject piping welds due to their design and ultrasonic access restrictions. Although the ASME Code-required coverage could not be obtained, the UT methods employed would have provided full volumetric coverage for the near-side of the welds and limited volumetric coverage for the weld fusion zone and base materials on the opposite side of the welds. Based on the aggregate coverage obtained for the subject welds, and considering the licensee's performance of UT techniques used to maximize this coverage, it is reasonable to conclude that if significant service-induced degradation were occurring, evidence of it would have been detected by the examinations that were performed. Furthermore, the NRC staff determined that the examinations performed provide reasonable assurance of structural integrity of the subject welds.

3.8 Request for Relief 09-002-II, Part I, ASME Code, Section XI, Examination Category C-F-2, Item C5.51, Pressure Retaining Welds in Carbon or Low Alloy Steel Piping

ASME Code Requirement

ASME Code, Section XI, Examination Category C-F-2, Item C5.51 requires 100 percent volumetric and surface examinations, as defined by ASME Code, Section XI, Figure IWC-2500-7, of selected circumferential ASME Code, Class 2 carbon or low alloy steel piping welds. ASME Code Case N-460, as an alternative approved for use by the NRC in RG 1.147, Revision 15, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

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[3] F. V. Ammirato, X. Edelmann, and S. M. Walker, *Examination of Dissimilar Metal Welds in BWR Nozzle-to-Safe End Joints*, 8th International Conference on NDE in the Nuclear Industry, ASM International, 1987.

[4] P. Lemaitre, T. D. Koble, and S. R. Doctor, *PISC III Capability Study on Wrought-to-Wrought Austenitic Steel Welds: Evaluation at the Level of Procedures and Techniques*, Effectiveness of Nondestructive Examination Systems and Performance Demonstration, PVP-Volume 317, NDE-Volume 14, ASME, 1995.

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code-required volumetric examinations of the carbon steel piping welds shown in Table 3.9.1 below.

Table 3.9.1 ASME Code, Section XI, Examination Category C-F-2			
ASME Code Item	Weld Identifier	Weld Configuration	ASME Coverage Obtained
C5.51	C2.1.118	Sweepolet-to-Flange	74%
C5.51	C2.1.122	Sweepolet-to-Flange	79.86%
C5.51	C2.1.132	Valve-to-Pipe	50%
C5.51	C2.1.290	Sweepolet-to-Flange	74%

Note: In response to the NRC staff's RAI, the licensee withdrew its relief for welds C2.1.121 and C2.1.8 because the licensee determined that volumetric coverage exceeded the ASME Code minimum requirements.

Licensee's Basis for Relief Request (as stated)

> [UT] examination of the above pipe welds was limited in coverage due to component configuration and/or immovable physical barriers. It is not possible to perform a 100 percent [UT] examination from both sides of the weld since one side of the weld was not suitable for scanning based on the scanning surface angle of the component. Therefore, the welds only received a single sided examination or partial single sided examination resulting in less than 90 percent coverage of the required examination volume.

Licensee's Proposed Alternative Examination:

The licensee did not propose any alternative examinations for the subject welds. However the licensee's examinations were performed to the maximum extent practical.

NRC Staff Evaluation

The ASME Code requires essentially 100 percent volumetric and surface examination for selected ASME Code, Section XI, Examination Category C-F-2 pressure retaining welds in piping. However, volumetric examinations are limited by configurations of the welds. In order to increase volumetric coverage, the welds would require design modifications. Imposition of this requirement would create a burden on the licensee.

As shown on the sketches and technical descriptions included in the licensee's submittal, access for examination on these carbon steel piping welds is limited due to the surface angle caused by the sweepolet-to-flange and pipe-to-valve configurations (see Table 3.10.1 above). The licensee obtained approximately 50 percent to 80 percent volumetric coverage from both sides of the welds, using 45-, 60-, and 70-degree shear waves. The ultrasonic methods

employed for these welds have been qualified through the industry's PDI Program, which meets ASME Code, Section XI, Appendix VIII requirements. Results of recent NDE reliability studies[5] for ultrasonic examination have typically shown a high probability (>0.9) of detecting significant flaws in ferritic welds. No recordable indications were noted during the performance of the volumetric examinations.

The licensee has shown that it is impractical to meet the ASME Code-required volumetric examination coverage for the subject weld configurations. Based on the limited examination performed, and considering the enhanced detection capabilities of performance demonstrated techniques on ferritic welds, it is reasonable to conclude that, if significant service-induced degradation had occurred in the subject welds, evidence of it would have been detected by the examinations that were performed. Furthermore, the NRC staff determined that the examinations performed provide reasonable assurance of structural integrity of the subject welds.

4.0 CONCLUSIONS

The NRC staff has reviewed the licensee's submittal and determined that imposition of these ASME Code requirements would create a burden on the licensee. The NRC staff further determined that based on the volumetric and surface coverage, if applicable, obtained on the subject welds, it is reasonable to conclude that when significant service-induced degradation has occurred, evidence of it would have been detected by the examinations that were performed. Furthermore, the NRC staff concluded that examinations performed to the extent practical provide reasonable assurance of structural integrity of the subject welds. Therefore, the NRC staff concluded that ASME Code examination coverage requirements are impractical for the subject welds listed in RRs 09-001-II, 09-002-II and 09-003-II, Parts A through I.

Accordingly, the NRC staff concluded that the licensee has adequately addressed all of the regulatory requirements set for in 10 CFR 50.55a(g)(6)(i), and is in compliance with the requirements of 10 CFR 50.55a with the granting of this relief. Therefore, the NRC grants relief to CR-3 for the subject examinations of the components contained in RRs 09-001-II, 09-002-II, and 09-003-II, Parts A through C and Parts E through I for the third 10-year ISI interval. For RR 09-001-II, Part D, relief is granted provided the licensee examines valve body-to-canopy weld B6.6.7 once during any inspection interval in which the subject weld becomes accessible in the future.

The NRC staff has further determined that granting RRs 09-001-II, 09-002-II, and 09-003-II, Parts A through I to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security, and is otherwise in the public interest given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

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[5] P. G. Heasler and S. R. Doctor, 1996. *Piping Inspection Round Robin*, NUREG/CR-5068, PNNL-10475, U. S. Nuclear Regulatory Commission, Washington, DC.

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

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Date: March 19, 2010

SUMMARY OF RELIEF REQUESTS								
Relief Request Number	TLR RR Sec.	System or Component	Exam. Category	Item No.	Volume or Area to be Examined	Required Method	Licensee Proposed Alternative	Relief Request Disposition
09-003-II, Revision 1 Part A	3.1	Pressure Retaining Welds in Reactor Vessel	B-A	B1.11 B1.12	100% of Class 1 RPV circumferential and longitudinal shell welds	Volumetric	Use volumetric coverage(s) achieved	Granted 10 CFR 50.55a(g)(6)(i)
09-003-II, Revision 1 Part B	3.2	Full Penetration Welded Nozzles in Vessels	B-D	B3.90	100% of Class 1 RPV nozzle-to-vessel Welds	Volumetric	Use volumetric coverage(s) achieved	Granted 10 CFR 50.55a(g)(6)(i)
09-001-II, Part C	3.3	Full Penetration Welded Nozzles in Vessels	B-D	B3.110 B3.120 B3.130 B3.140	100% of Class 1 Pressurizer and Steam Generator nozzle-to-vessel welds	Volumetric	Use volumetric coverage(s) achieved	Granted 10 CFR 50.55a(g)(6)(i)
09-001-II, Part D	3.4	Pressure Retaining Welds in Valve Bodies	B-M-1	B12.40	100% of Class 1 valve body welds NPS 4 or larger	Volumetric	Use volumetric coverage achieved	Granted 10 CFR 50.55a(g)(6)(i)
09-001-II, Part E	3.5	Class 1 Risk Informed Piping Examinations	R-A	R1.20	100% of selected piping welds not subject to a damage mechanism per RI-ISI Program	Volumetric	Use volumetric coverage achieved	Granted 10 CFR 50.55a(g)(6)(i)
09-002-II, Part F	3.6	Pressure Retaining Welds in Pressure Vessels	C-A	C1.10	100% of Class 2 circumferential shell welds	Volumetric	Use volumetric coverage achieved	Granted 10 CFR 50.55a(g)(6)(i)
09-002-II, Part G	3.7	Pressure Retaining Nozzle Welds in Vessels	C-B	C2.21	100% of Class 2 nozzle to head weld	Surface and Volumetric	Use volumetric coverage achieved	Granted 10 CFR 50.55a(g)(6)(i)
09-002-II, Part H	3.8	Pressure Retaining Welds in Austenitic Stainless Steel or High Alloy Piping	C-F-1	C5.11 C5.21	100% of selected Class 2 circumferential piping welds	Surface and Volumetric	Use volumetric coverage(s) achieved	Granted 10 CFR 50.55a(g)(6)(i)
09-002-II, Part I	3.9	Pressure Retaining Welds in Carbon or Low Alloy Steel	C-F-2	C5.51	100% of Class 2 circumferential piping welds	Surface and Volumetric	Use volumetric coverage(s) achieved	Granted 10 CFR 50.55a(g)(6)(i)

Attachment

degradation has occurred, evidence of it would have been detected by the examinations that were performed. The NRC staff found that the ASME Code examination coverage requirements are impractical for the subject welds listed in RRs 09-001-II, 09-002-II and 09-003-II. Furthermore, the NRC staff determined that imposition of these ASME Code requirements would create undue burden on the licensee and that examinations performed to the extent practical provide reasonable assurance of structural integrity of the subject welds.

Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i), and is in compliance with the requirements of 10 CFR 50.55a with the granting of this relief. The NRC staff has further concluded that granting RRs 09-001-II, 09-002-II, and 09-003-II in accordance with the requirements of 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security, and is otherwise in the public interest given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Therefore, the NRC grants relief to CR-3 for the subject examinations of the components contained in RRs 09-001-II, 09-002-II, and 09-003-II, except valve body-to-canopy weld B6.6.7 in RR 09-001-II, for the third 10-year ISI interval. For valve body-to-canopy weld B6.6.7 in RR 09-001-II, relief is granted provided the licensee examines valve body-to-canopy weld B6.6.7 during any inspection interval in which the subject weld becomes accessible in the future.

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,

/RA/
Douglas A. Broaddus, Acting Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-302

Enclosure: Safety Evaluation

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