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

April 25, 2011

Vice President, Operations
Entergy Nuclear Operations, Inc.
Indian Point Energy Center
450 Broadway, GSB
P.O. Box 249
Buchanan, NY 10511-0249

SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT NO. 3 - RELIEF FROM THE REQUIREMENTS OF THE ASME CODE TO PERFORM ESSENTIALLY 100 PERCENT VOLUMETRIC EXAMINATION OF THE WELD AND ADJACENT BASE MATERIAL FOR THE THIRD 10-YEAR INSERVICE INSPECTION INTERVAL PROGRAM (TAC NOS. ME4234 AND 4235)

Dear Sir or Madam:

By letter dated July 5, 2010, as supplemented by letters dated December 8, 2010 and January 4, 2011, Entergy Nuclear Operations, Inc. (the licensee) submitted Relief Requests RR-3-49 and RR-3-50, to the U.S. Nuclear Regulatory Commission (NRC) for relief from certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI requirements at Indian Point Nuclear Generating Unit No. 3 (IP3).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g)(5)(iii), the licensee requested relief and to use alternative requirements (if necessary), for inservice inspection (ISI) items on the basis that the Code requirement is impractical.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that the ASME Code examination coverage requirements are impractical for the subject welds listed in the Relief Requests RR-3-49 and RR-3-50. Further, based on the volumetric coverage obtained, it is concluded that, if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would have been detected by the examinations that were performed. Therefore, for the items in Relief Requests RR-3-49 and RR-3-50 relief is granted, pursuant to 10 CFR 50.55a(g)(6)(i), for the Third 10-year ISI interval at Indian Point Unit 3 which began on July 21, 2000 and ended on July 20, 2009. The NRC staff has further determined that granting relief for Relief Requests RR-3-49 and RR-3-50, pursuant 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.

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

If you have any questions, please contact the Indian Point Senior Project Manager, John Boska, at (301) 415-2901.

Sincerely,

Nancy L. Salgado

Nancy L. Salgado, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-286

Enclosure:
As stated

cc w/encl: Distribution via Listserv

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ON THE THIRD 10-YEAR INTERVAL INSERVICE INSPECTION

RELIEF REQUEST NOS. RR-3-49 AND RR-3-50

ENTERGY NUCLEAR OPERATIONS, INC.

INDIAN POINT NUCLEAR GENERATING UNIT NO. 3

DOCKET NO. 50-286

1.0 INTRODUCTION

By letter dated July 5, 2010 (Agencywide Document Access and Management System (ADAMS) Accession No. ML101950041), as supplemented by letters dated December 8, 2010 (ADAMS Accession No. ML103510364), and January 4, 2011 (ADAMS Accession No. ML110110164), Entergy Nuclear Operations, Inc. (Entergy), the licensee for Indian Point Nuclear Generating Unit No. 3 (IP3), (the licensee) submitted Relief Requests RR-3-49 and RR-3-50 requesting relief from certain inservice inspection (ISI) requirements in Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code). In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g)(5)(iii), the request proposes relief from the requirement to perform essentially 100 percent volumetric examination of the weld and adjacent base material.

The subject relief request is for the Third 10-Year Inservice Inspection Interval Program at IP3 which began on July 21, 2000, and ended on July 20, 2009.

2.0 REGULATORY REQUIREMENTS

The U.S. Nuclear Regulatory Commission (NRC) regulations in 10 CFR 50.55a(g) specify that ISI of the ASME Code Class 1, 2, and 3 nuclear power plant components shall be performed in accordance with the requirements of the ASME Code, Section XI, "Rules for In service Inspection of Nuclear Power Plant Components," of the ASME Code and applicable editions and addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission. The requirements in 10 CFR 50.55a(g)(6)(i) state that the NRC 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, given the consideration of the burden upon the licensee. 10 CFR 50.55a(g)(5)(iii) states that if the licensee has determined that conformance with certain ASME Code requirements is impractical for its facility, the licensee shall notify the NRC and submit, as specified in Section 50.4, information to support the determinations.

Enclosure

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and 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 ISI 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.

3.0 TECHNICAL EVALUATION

3.1 Relief Request RR-3-49

3.1.1 Applicable ASME Code Edition and Addenda

The ASME Code of Record for the third 10-year ISI program at IP3, which began on July 21, 2000 and ended on July 20, 2009 was the 1989 Edition, no Addenda of the ASME Code, Section XI. Additionally, the 1995 Edition with the 1996 Addenda was used for the ASME Code, Section XI, Appendix VIII, *Performance Demonstration for Ultrasonic Examination Systems*.

3.1.2 Applicable ASME Code Requirement

ASME Code, Section XI, Sub-Article IWB-2500 states in part, "Components shall be examined and tested as specified in Table IWB-2500-1." Table IWB-2500-1 requires an examination of applicable Class 1 pressure retaining welds, which includes essentially 100 percent of weld length once during the 10-year interval for Examination Category B-A, Item Number B1.22 and Examination Category R-A, Item Number AUGmented Risk-Informed (AUGR)[1].

A risk-informed inservice inspection (RI-ISI) program was approved for IP3 by the NRC on February 4, 2003 (ML030350674). The RI-ISI program was developed for Class 1 Examination Category B-F and B-J circumferential piping welds in a manner consistent with ASME Code Case (CC) N-578. ASME Code Case N-578 examination requirements for Examination Category R-A, Item No. AUGR require essentially 100 percent of the required volume of the weld and adjacent base material to be examined.

ASME Code Case N-460, *Alternative Examination Coverage for Class 1 and Class 2 Welds*, as an alternative approved for use by the NRC in Regulatory Guide (RG) 1.147, Revision 16,

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[1] In their response to the NRC's Request for Additional Information (RAI), the licensee clarified that the Indian Point Energy Center (IPEC) RI-ISI program was developed using the process described in Electric Power Research Institute Topical Report EPRI TR 112657, Revision B-A, Revised Risk-Informed Inservice Inspection Evaluation Procedure and was conducted in a manner consistent with ASME Code Case N-578. However, since it was not developed to meet ASME Code Case N-578 and was an augmented requirement, IPEC used item number AUGR (AUGmented Risk-Informed) and did not use the item numbers from ASME Code Case N-578, Table 1. In the RAI response, the licensee provided the damage mechanism for each AUGR weld contained in this relief request. Additionally, the item number and examination method from ASME Code Case N-578, Table 1 was provided for informational purposes.

Inservice Inspection Code Case Acceptability, 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. IP3 has adopted ASME Code Case N-460 in their ISI Program Plan.

3.1.3 Components for Which Relief is Requested

ASME Code Class: Class 1
Examination Categories: B-A and R-A
Item Numbers: B1.22 and AUGR

Cat	Item Number	CC N-578 Item Number	CC N-578 Damage Mechanism	Component ID	Dia (in)	Thk (in)	Matl	Coverage	Description
B-A	B1.22	NA	NA	1-1300-2	NA	7.5	CS	59%	RV Meridional Weld
B-A	B1.22	NA	NA	1-1300-3	NA	7.5	CS	84%	RV Meridional Weld
B-A	B1.22	NA	NA	1-1300-4	NA	7.5	CS	59%	RV Meridional Weld
B-A	B1.22	NA	NA	1-1300-5	NA	7.5	CS	84%	RV Meridional Weld
B-A	B1.22	NA	NA	1-1300-6	NA	7.5	CS	59%	RV Meridional Weld
B-A	B1.22	NA	NA	1-1300-7	NA	7.5	CS	84%	RV Meridional Weld
R-A	AUGR	R1.16	IGSCC	1-4401-12	10	1	SS	50%	Elbow-to-Nozzle Weld
R-A	AUGR	R1.16	IGSCC	1-4301-12	10	1	SS	50%	Elbow-to-Nozzle Weld
R-A	AUGR	R1.20	None	1-4103-4	3	0.44	SS	65%	Pipe-to-Tee weld
R-A	AUGR	R1.20	None	1-4100-15	27.5	2.2	SS	45%	Cast SS elbow
R-A	AUGR	R1.20	None	1-4200-15	27.5	2.2	SS	45%	Cast SS elbow
R-A	AUGR	R1.20	None	1-4300-15	27.5	2.2	SS	45%	Cast SS elbow
R-A	AUGR	R1.20	None	1-4400-15	27.5	2.2	SS	45%	Cast SS elbow

Key: NA = not applicable CS = carbon steel RV = reactor vessel SS = stainless steel
SS = stainless steel IGSCC = intergranular stress-corrosion cracking

3.1.4 Licensee Basis for Relief (as stated)

B1.22 RV Head Meridional Welds; 1-1300-3, 1-1300-5 & 1-1300-7

The Reactor Vessel (RV) Meridional Head welds are 56" long, with a total accessible weld length of 26". The ASME Code Required Volume (CRV) was interrogated ultrasonically using personnel and procedures qualified in accordance with ASME [Code] Section XI, Appendix VIII, Supplements 4 and 6 (Performance Demonstration Initiative (PDI)). [ASME] Code coverage of the CRV was only credited for those areas that were examined in accordance with the qualified procedure. The ASME Section XI Code requirement is to examine essentially 100% of the weld.

The accessible length of the welds were scanned with the transducer oriented perpendicular to the weld centerline in two (2) directions using a 60-degree refracted longitudinal (RL) transducer, which resulted in 100% coverage of the CRV for that scan direction. The welds were also scanned with the transducer oriented parallel to the weld. The welds are tapered adjacent to the head flange for approximately four (4) inches of the weld, where the material thickness exceeds the maximum range for the qualified procedure, 7.64" thickness. The tapered areas were examined; however [ASME] Code coverage was not credited in those areas.

The scan parallel to the welds was limited due to the RV head flange at one end of the weld and a taper on the other end of the weld. These physical limitations resulted in approximately 84% coverage, which is less than the required coverage of the CRV.

B1.22 RV Head Meridional Welds: 1-1300-2, 1-1300-4 & 1-1300-6

The Reactor Vessel (RV) Meridional Head welds are 56" long, with a total accessible weld length of 26". The [CRV] was interrogated ultrasonically using personnel and procedures qualified in accordance with ASME [Code] Section XI, Appendix VIII, Supplements 4 and 6 [PDI]. [ASME] Code coverage of the CRV was only credited for those areas that were examined in accordance with the qualified procedure. The ASME Section XI Code Requirement is to examine essentially 100% of the weld.

The accessible length of the welds were scanned with the transducer oriented perpendicular to the weld centerline in two (2) directions using a 60 degree [RL] transducer. The welds were also scanned with the transducer oriented parallel to the weld. The welds are tapered adjacent to the head flange for approximately four (4) inches of the weld, where the material thickness exceeds the maximum range for the qualified procedure, 7.64" thickness. The tapered areas were examined; however [ASME] Code coverage was not credited in those areas. These 3 welds also have the RV head lifting lugs located directly on top of the welds further restricting the examination in those areas.

The scan parallel to the welds was limited due to the RV head flange at one end of the weld, the RV head lifting lugs, and a taper on the other end of the weld. The scan perpendicular to the welds was limited due to the RV head lifting lugs. These physical limitations resulted in approximately 59% coverage, which is less than the required coverage of the CRV.

AUGR Class 1 Risk Informed Piping Welds: 1-4401-12, 1-4301-12 & 1-4103-4

The above listed welds were ultrasonically examined using PDI qualified personnel and procedures in accordance with ASME [Code] Section XI, Appendix VIII. The ultrasonic examination of these pipe welds was limited in coverage due to component configuration. 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 due to the OD [outside diameter] surface geometry of the component; therefore, the welds only received a single-sided examination or partial single-sided examination resulting in less than 90% coverage of the required examination volume. The percentage of coverage reported represents the aggregate coverage from all examination angles and scans performed on the weld and adjacent base material.

Welds 1-4401-12 and 1-4301-12 are nozzle to elbow welds with no inspection able to be performed from the nozzle side due to component geometry. This physical limitation resulted in approximately 50% coverage, which is less than the required coverage of the CRV. Weld 1-4301-4 is a tee-to-elbow weld with a limited inspection able to be performed from the tee side due to component geometry. This physical limitation resulted in approximately 65% coverage, which is less than the required coverage of the CRV.

AUGR Class 1 Risk Informed Piping Welds: 1-4100-15, 1-4200-15, 1-4300-15 & 1-4400-15

The [ASME] Code requirement is to examine components with techniques qualified in accordance with ASME [Code] Section XI, Appendix VIII. There are currently no Appendix VIII (PDI) qualified procedures to inspect cast stainless steel (A351 Grade CF8M) materials. The [RV] inlet nozzle configuration is an austenitic steel safe-end welded to a cast stainless steel elbow.

The entire [ASME Code -required] volume was examined employing the Appendix VIII procedure qualified for the examination of austenitic steel welds from the [inside diameter] ID surface. Examinations conducted using this procedure met or exceeded the required Appendix III examinations. [The ASME code-required] examination volume that was scanned is estimated at greater than 96 %. This coverage calculation considers all four required examination beam directions and shows that greater than 96% of the [ASME Code-required] examination volume was scanned on all 4 welds. The only limitations to scanning were due to minor [ID] surface condition configurations.

ASME Code coverage for the examination of the cast stainless steel elbows cannot be credited since the procedure is not qualified for the cast stainless steel material examined. Therefore, when disallowing examination into or from the cast stainless steel material, coverage of the [ASME Code-required] volume is estimated at 45%. The limited coverage area includes any area which requires the sound to pass through the cast stainless steel material.

A supplemental Eddy Current examination was also performed on the ID surface for each of these welds and adjacent piping base metal. This supplemental examination interrogated 100% of the exposed surface of the Ultrasonic Examination [ASME] Code required volume. No recordable indications were revealed by this Eddy Current examination of these (4) welds.

3.1.5 Licensee's Proposed Alternative Examination

The licensee stated that no alternative examinations were performed for the welds during the completed inspection interval. The licensee stated that the ultrasonic examinations were completed to the extent practical and no unacceptable flaws were present. The use of radiography was not practical due to component thickness and/or geometric configurations as well as physical barriers prohibiting access for placement of source, film, image quality indicator, etc. The component welds were inspected by volumetric and surface NDE methods during construction and verified to be free from unacceptable fabrication defects.

The licensee also stated that ASME Code, Section XI, Table IWB-2500-1, Examination Category B-P System Leakage Tests and VT-2 visual examinations performed each refueling outage provide adequate assurance of pressure boundary integrity. Additionally, VT-2 examination performed on the subject Class 1 components during system pressure testing each refueling outage provide continued assurance that the structural Integrity of the subject components is maintained. In addition to the above ASME Code-required examinations, the following other activities provide a high level of confidence that, in the unlikely event that leakage did occur through these welds, it would be detected and proper action taken. Specifically, system leak rate limitations imposed by Technical Specifications as well as containment building normal sump rate monitoring, provide additional assurance that any leakage would be detected prior to gross failure of the component.

3.1.6 Duration of Proposed Alternative

The proposed alternative is requested for the third 10-year ISI interval for IP3 which began on July 21, 2000, and ended on July 20, 2009.

3.1.7 Staff Evaluation

The ASME Code requires essentially 100 percent volumetric examination of the accessible length of B-A and R-A welds. However, for the subject welds at IP3, complete examinations are restricted for various reasons. The details for each set of welds are discussed below.

B1.22 RV Head Meridional Welds: 1-1300-3, 1-1300-5 & 1-1300-7 (Odd-Numbered Welds)

As shown in the sketch included in the licensee's July 5, 2010 letter, only 26" on each of the 56"-long, odd-numbered, RV head meridional welds are accessible. The accessible regions of these welds were examined 100 percent and no indications were found; however, at both ends of the weld, the thickness exceeded the maximum thickness for the inspection procedure qualification. Therefore, the licensee is only taking credit for 84 percent coverage of the accessible regions from these three odd-numbered, RV head meridional welds.

The NRC staff requested additional information from the licensee regarding past inspections of these RV head meridional welds. In its December 8, 2010 letter, the licensee stated that at the time of the last inspection (1989), the same physical limitations were noted. The ASME Code requirements in 1989 were different (1983 Edition of ASME Code Section XI); only one of the six RV meridional head welds was required to be essentially 100 percent volumetrically inspected. Portions of all six RV meridional head welds (the same regions inspected in this latest ISI interval) were inspected to take credit for the equivalent of 100 percent coverage on one weld. No indications were detected during that 1989 inspection. The only difference between the 1989 and the 2009 inspections was that the ultrasonic examination of the welds in 2009 was conducted using PDI qualified personnel and procedures in accordance with ASME Code, Section XI, Appendix VIII.

The staff noted that the RV design features make the ASME Code-required 100 percent coverage for the examinations impractical to meet. The RV would require design modifications and imposition of this requirement would cause a significant burden on the licensee. For the odd-numbered, meridional welds, the licensee obtained 84 percent volumetric coverage of the accessible regions for each weld. The staff determined that these examinations would have detected any significant patterns of degradation, if any had occurred. The staff also determined that the volumetric and VT-2 visual examinations performed provide reasonable assurance of structural integrity of the subject welds.

Based on the above discussion, the NRC staff concludes that the licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the three odd-numbered, RV head meridional welds due to their design configuration. However, based on the examination coverage that was obtained, along with the examinations of other RV 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 staff concludes that the examinations performed provide reasonable assurance of structural integrity of the subject welds.

B1.22 RV Head Meridional Welds: 1-1300-2, 1-1300-4 & 1-1300-6 (Even-Numbered Welds)

Similar to the case for the odd-numbered welds, only 26" on each of the 56"-long, even-numbered, RV head meridional welds are accessible. The accessible regions of these welds were examined 100 percent and no indications were found; in addition to the areas at both ends of the weld where the thickness exceeded the maximum thickness for the inspection procedure qualification, there are RV lifting lugs that are right on top of the welds, which obstructed the motion of the UT sensors. This created additional regions within the accessible length where inspection coverage was limited. Therefore, the licensee is only

taking credit for 59 percent coverage of the accessible regions from these three even-numbered, RV head meridional welds.

The NRC staff requested additional information from the licensee regarding past inspections of these RV head meridional welds. In the December 8, 2010 letter, the licensee has stated that at the time of the last inspection (1989), the same physical limitations were noted. Given the ISI requirements in effect at the time, portions of all six RV meridional head welds (the same regions inspected in this latest ISI interval) were inspected to take credit for the equivalent of 100 percent coverage on one weld. No indications were detected during that 1989 inspection. The only difference between the 1989 and the 2009 inspections was that the ultrasonic examination of the welds in 2009 was conducted using PDI qualified personnel and procedures in accordance with ASME Code, Section XI, Appendix VIII.

The NRC staff noted that the RV design features make the ASME Code-required 100 percent coverage for the examinations impractical to meet. In order for the licensee to perform the required ASME Code examination, the RV would require design modifications and imposition of this requirement would cause a significant burden on the licensee. For the even-numbered, meridional welds, the licensee obtained volumetric coverage of 59 percent for each weld. The staff determined that these examinations would have detected any significant patterns of degradation, if any had occurred. The staff also determined that the volumetric and VT-2 visual examinations performed provide reasonable assurance of structural integrity of the subject welds.

Based on the above discussion, the NRC staff concludes that the licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the three even-numbered, RV head meridional welds due to their design configuration.

However, based on the examination coverage that was obtained, along with the examinations of other RV 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 staff concludes that the examinations performed provide reasonable assurance of structural integrity of the subject welds.

AUGR Class 1 Risk Informed Piping Welds: 1-4401-12, 1-4301-12 & 1-4103-4

The examination requirements for the subject piping welds at IP3 are governed by an RI-ISI program that was approved by the NRC in a Safety Evaluation dated February 4, 2003, for those items in Examination Category R-A, Item Number AUGR. Though the approved IP3 RI-ISI program uses Item Number AUGR, as explained by the licensee in their response to the NRC's RAI, these welds fall into ASME Code Case N-578 Examination Category R-A, Item R1.16 for piping elements subject to Intergranular Stress-Corrosion Cracking (IGSCC) (Welds 1-4401-12 and 1-4301-12), and Examination Category R-A, Item R1.20, for piping elements not subject to a damage mechanism (Weld 1-4103-4). Each item in this request requires inspection of 100 percent of the examination volume for each Class 1 weld.

For the welds at IP3, 100 percent examination of the required examination volume is not possible due to component configuration. The licensee could not perform the ultrasonic examination from both sides of the weld since one side of the weld was not suitable for scanning

due to the outside diameter (OD) surface geometry of the component. In order to achieve additional coverage, the components would have to be redesigned, which is impractical. For welds 1-4401-12 and 1-4301-12, which are nozzle-to-elbow welds, inspections from the nozzle side were not possible. As shown on the sketches and technical descriptions included in the licensee's submittal, examinations of the subject piping welds have been completed to the extent practical resulting in an aggregate volumetric coverage of 50 percent of the ASME Code-required volume. Weld 1-4301-4 is a tee to elbow weld; limited inspection was possible on the tee side of this weld. As shown on the sketches and technical descriptions included in the licensee's submittal, examinations of the subject piping welds have been completed to the extent practical resulting in an aggregate volumetric coverage of 65 percent of the ASME Code-required volume.

Ultrasonic examination of the welds was conducted using Performance Demonstration Initiative (PDI) qualified personnel and procedures in accordance with ASME Code, Section XI, Appendix VIII. Examinations of Welds 1-4401-12 and 1-4301-12 included 45- degree shear wave and 60-degree refracted longitudinal wave techniques, as applicable, from the accessible sides of these welds. Weld 1-4103-4 was inspected using 45- and 70-degree shear wave techniques. The refracted longitudinal wave method is capable of detecting planar inside diameter (ID) surface-breaking flaws on the far-side of wrought stainless steel welds. Recent studies[2,3] recommend the use of both shear and L-waves to obtain the best detection results, with minimum false calls, in austenitic welds. No unacceptable indications (other than geometric indications) were found during the ultrasonic examinations.

In their RAI, the NRC staff asked the licensee why these welds were selected for the RI-ISI program and were there other choices that could have been made to either completely replace or supplement these selections that resulted in lack of ASME Code-required coverage. In their response to the NRC's RAIs, the licensee explained that as part of the RI-ISI program, every effort was made to choose welds that would not have limitations. However, consistent with ASME Code, Section XI guidance, welds were chosen at terminal ends or at structural discontinuities such as nozzles and fittings. The licensee further stated that Welds 1-4401-12 and 1-4403-12 are the elbow to nozzle welds that are the first welds off the Reactor Coolant system (RCS) in the Safety Injection system. For each of these welds, the next weld in line was inspected with no limitations and no recordable indications noted. Additionally, nine other Safety Injection butt welds with the same damage mechanism were inspected during the interval with no limitations and no recordable indications noted. Weld 1-4103-4 is an elbow to tee weld in a drain line off the RCS in the Charging system. For this weld, the next weld in the line was inspected with no limitations and no recordable indications noted.

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

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2 Ammirato, F.V., 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.

3 Lemaitre, P., 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.

ultrasonic 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 information provided by the licensee including the aggregate coverage obtained for the subject welds, and considering the licensee's performance of ultrasonic 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.

AUGR Class 1 Risk Informed Piping Welds: 1-4100-15, 1-4200-15, 1-4300-15 & 1-4400-15

The examination requirements for the subject piping welds at IP3 are governed by an RI-ISI program that was approved by the NRC in an SE dated February 4, 2003, for those items in Examination Category R-A, Item Number AUGR. Though the approved IP3 RI-ISI program uses Item Number AUGR, as explained by the licensee in their response to the NRC's RAI, these welds fall into Code Case N-578 Examination Category R-A, Item R1.20, for piping elements not subject to a degradation mechanism (Welds 1-4100-15, 1-4200-15, 1-4300-15 & 1-4400-15). Each item in this request requires inspection of 100 percent of the examination volume for each Class 1 weld.

The ASME Code requirement is to examine components with techniques qualified in accordance with ASME Code, Section XI, Appendix VIII. There are currently no Appendix VIII (PDI) qualified procedures to inspect cast stainless steel (A351 Grade CF8M) materials. The licensee stated that the Reactor Vessel inlet nozzle configuration is an austenitic steel safe-end welded to a cast stainless steel elbow. Ultrasonic examinations were conducted using 70 degree refracted longitudinal wave techniques applied from the ID of the pipe. No unacceptable indications (other than geometric indications) were found during these ultrasonic examinations. Though the licensee examined each of the four welds from all four required examination beam directions, covering greater than 96 percent of the ASME Code required examination volume, ASME Code coverage for the examination of the cast stainless steel elbows cannot be credited since the procedure is not qualified for the cast stainless steel material examined. Therefore, when disallowing examination into or from the cast stainless steel material, the licensee estimated the coverage of the ASME Code-required volume to be 45 percent. The licensee performed a supplemental eddy current examination on the ID surface for each of these welds and adjacent piping base metal. This supplemental examination interrogated 100 percent of the exposed surface of the ultrasonic examination ASME Code-required volume. No recordable indications were revealed by this eddy current examination of these four (4) welds.

In their RAI, the NRC staff asked the licensee why these items were selected for the RI-ISI program and were there other choices that could have been made to either completely replace or supplement these selections that resulted in lack of ASME Code required coverage. In their response to the NRC's RAIs, the licensee explained that as part of the RI-ISI program, every effort was made to choose welds that would not have limitations. However, consistent with ASME Code, Section XI guidance, welds were chosen at terminal ends or at structural discontinuities such as nozzles and fittings. The licensee further stated that Welds 1-4100-15, 1-4200-15, 1-4300-15 and 1-4400-15 are welds joining cast stainless steel elbows to the Reactor Vessel cold leg nozzle safe-end in the RCS. For each of these welds, the next weld in line (weld 16DM which is an Alloy 600 dissimilar metal weld) was inspected with no limitations and no unacceptable recordable indications noted. Additionally, 13 other Reactor Coolant butt

welds with no damage mechanism were inspected during the interval with no limitations and no recordable indications noted.

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 the cast stainless steel elbows, for which there is no qualified examination procedure. Based on the information provided by the licensee, the staff determined that the inspections achieved adequate coverage of the susceptible material to conclude that if significant service-induced degradation were occurring, evidence of it would have been detected by the examinations that were performed.

3.2 Relief Request RR-3-50

3.2.1 Applicable ASME Code Edition and Addenda

The Code of record for the third 10-year ISI program at IP3, which began on July 21, 2000, and ended on July 20, 2009, was the 1989 Edition, no Addenda of the ASME Code, Section XI. Additionally, the 1995 Edition with the 1996 Addenda was used for the ASME Code, Section XI, Appendix VIII, *Performance Demonstration for Ultrasonic Examination Systems.*

3.2.2 Applicable ASME Code Requirement

ASME Code, Section XI, Sub-Article IWC-2500 states in part, "Components shall be examined and tested as specified in Table IWC-2500-1." Table IWC-2500-1 requires an examination of applicable Class 2 pressure retaining welds, which includes essentially 100 percent of weld length once during the 10-year interval for Examination Category C-A, Item Numbers C1.10 and C1.20 and Examination Category C-F-1, Item Numbers C5.11 and C5.21.

ASME Code Case N-460, as an alternative approved for use by the NRC in RG 1.147 Revision 16, 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. IP3 has adopted ASME Code Case N-460 in their ISI Program Plan.

3.2.3 Components for Which Relief is Requested

ASME Code Class: Class 2
Examination Category: C-A and C-F-1
Item Number: C1.10, C1.20, C5.11 and C5.21

Cat	Item	Component ID	Dia (in)	Thk (in)	Matl	Coverage	Description
C-A	C1.10	2-1120-31-2	NA	.75	SS	75%	RHR Heat Exchanger Shell Circ Weld
C-A	C1.20	2-1220-2	NA	2.7	CS	81%	Boron Injection Tank Head Circ Weld
C-F-1	C5.11	2-2532-6	6	.562	SS	75%	RHR Circ Pipe Weld
C-F-1	C5.21	2-2546-3	4	.337	SS	75%	Safety Injection Circ Pipe Weld

3.2.4 Licensee Basis for Relief (as stated)

Residual Heat Removal Heat Exchanger Shell Circumferential Weld 2-1120-31-2

The Residual Heat Removal (RHR) Heat Exchanger Shell Circumferential Weld [2-1120- 31-2] is 133" long and attaches the heat exchanger shell to a flange. The [CRV] was interrogated ultrasonically using personnel and procedures in accordance with ASME [Code] Section XI. [ASME] Code coverage of the CRV was only credited for those areas that were examined in accordance with the procedure requirements. The ASME Section XI Code Requirement is to examine essentially 100% of the weld.

Due to the proximity of the heat exchanger flange to weld [Z-1120-31-2], the weld could not be scanned from the flange side. This physical limitation resulted in approximately 75% coverage, which is less than the required coverage of the [CRV].

Boron Injection Tank Head Circumferential Weld 2-1220-2

The Boron Injection Tank Head Circumferential Weld [2-1220-2] is 168" long and attaches the Boron Injection Tank lower head to the shell. The [CRV] was interrogated ultrasonically using personnel and procedures in accordance with ASME [Code] Section XI. [ASME] Code coverage of the CRV was only credited for those areas that were examined in accordance with the procedure requirements. The ASME Section XI, Code requirement is to examine essentially 100% of the weld.

Due to four 8" wide integrally welded support legs which are used to support the tank, the lower head to shell weld could not be scanned behind the support legs. This physical limitation resulted in approximately 81% coverage, which is less than the required coverage of the CRV.

RHR Circumferential Pipe Weld 2-2532-6

The above listed weld was ultrasonically examined using qualified personnel and procedures in accordance with ASME [Code] Section XI, Appendix VIII, Supplement 2 [PDI]). The ultrasonic examination of this pipe weld was limited in coverage due to component configuration.

Weld 2-2532-6 is a flange-to-pipe weld and 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 due to the OD surface geometry of the component (flange). Therefore, the weld only received a single sided examination resulting in less than 90% coverage of the required examination volume. This physical limitation resulted in approximately 75% coverage, which is less than the required coverage of the CRV.

Safety Injection Circumferential Pipe Weld 2-2546-3

The above listed weld was ultrasonically examined using qualified personnel and procedures in accordance with ASME [Code] Section XI, Appendix VIII, Supplement 2 [PDI]). The ultrasonic examination of this pipe weld was limited in coverage due to component configuration.

Weld 2-2546-3 is a reducer-to-pipe weld and 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 due to the OD surface geometry of the component (reducer). Therefore, the weld only received a single-sided examination resulting in less than 90% coverage of the required examination volume. This physical limitation resulted in approximately 75% coverage, which is less than the required coverage of the CRV.

3.2.5 Licensee's Proposed Alternative Examination

The licensee stated that no alternative examinations were performed for the welds during the completed inspection interval. The licensee stated that the ultrasonic examinations were completed to the extent practical and no unacceptable flaws were present. The use of radiography was not practical due to component thickness and/or geometric configurations as well as physical barriers prohibiting access for placement of source, film, image quality indicator, etc. The component welds were inspected by volumetric and surface NDE methods during construction and verified to be free from unacceptable fabrication defects.

The licensee stated that the ultrasonic examinations were completed to the extent practical and evidenced no unacceptable flaws present. Additionally, VT-2 examinations performed on the subject Class 2 components during system pressure testing each refueling outage provide continued assurance that the structural integrity of the subject components is maintained.

The licensee also stated that ASME Code, Section XI, Table IWC-2500-1, Examination Category C-H System Leakage Tests and VT-2 visual examinations performed each inspection period provide adequate assurance of pressure boundary integrity. Additionally, VT-2 examinations performed on the subject Class 2 components during system pressure testing each refueling outage provide continued assurance that the structural integrity of the subject components is maintained. In addition to the above ASME Code-required examinations, there are other activities which provide a high level of confidence that, in the unlikely event that leakage did occur through these welds it would be detected and proper action taken. Specifically, system leak rate limitations imposed by Technical Specifications as well as containment building normal sump rate monitoring, provide additional assurance that any leakage would be detected prior to gross failure of the component.

3.2.6 Duration of Proposed Alternative

The proposed alternative is requested for the third 10-year ISI interval for IP3 which began on July 21, 2000 and ended on July 20, 2009.

3.2.7 Staff Evaluation

The ASME Code requires essentially 100 percent volumetric examination of the accessible length of C-A and C-F-1 welds. However, for the subject welds at IP3, complete examinations are restricted for various reasons. The details for each weld are discussed below.

C-A, C1.10 Item, RHR Heat Exchanger Shell Circumferential Weld 2-1120-31-2

Table IWC-2500-1 of Section XI of the ASME Code requires 100 percent volumetric examination of the shell circumferential welds (ASME Code, Section XI, Examination Category C-A pressure retaining welds in pressure vessels).

The volumetric examination must be applied from both sides of the weld to maximize coverage. As shown on the sketches and technical description included in the licensee's submittal, examination of the subject weld has been performed to the extent practical (examination from one side only) with the licensee obtaining volumetric coverage of approximately 75 percent. No unacceptable indications were noted during the performance of these examinations. The scan was limited due to an obstruction from the flange that is directly above the subject weld, all around the circumference of the vessel. Modifications to the component would be impractical. Imposition of this requirement would create a burden on the licensee; therefore, the ASME Code-required 100 percent volumetric examination from both sides of the weld is considered impractical.

To effectively evaluate the licensee's proposed alternative, the NRC staff requested additional information from the licensee regarding past inspections of this RHR shell circumferential weld. In its December 8, 2010 letter, the licensee has stated that at the time of the last inspection (1989), the same physical limitations were noted and 27 percent Ultrasonic Testing (UT) coverage was reported. No indications were detected during that 1989 inspection. The only difference between the 1989 and the 2009 inspections was that the ultrasonic examination of the welds in 2009 was conducted using PDI qualified personnel and procedures in accordance with ASME Code, Section XI, Appendix VIII.

The licensee has shown that it is impractical to meet the ASME Code-required volumetric examination coverage for the subject weld due to the unique design configuration of the weld. Based on the examination performed, along with the examination of pressure retaining welds in other ASME Code, Section XI Class 2 vessels, it is concluded that if significant service-induced degradation were occurring in the subject welds, there is reasonable assurance that evidence of it would have been detected. As such, the NRC staff further concludes that there is reasonable assurance of structural integrity of the subject weld based on the examination that has been performed.

Boron Iniection Tank Head Circumferential Weld 2-1220-2

Table IWC-2500-1 of Section XI of the ASME Code requires 100 percent volumetric examination of the shell circumferential welds (ASME Code, Section XI, Examination Category C-A pressure retaining welds in pressure vessels).

As shown on the sketches and technical description included in the licensee's submittal, the boron injection tank is supported by four 8"-wide welded legs. Examination of the subject circumferential weld joining the bottom head to the shell of the vessel has been performed to the extent practical with the licensee obtaining volumetric coverage of approximately 81 percent. No unacceptable indications were noted during the performance of these examinations. The scan was limited due to obstructions from the four legs. Modifications to the component would be impractical. Imposition of this requirement would create a burden on the licensee; therefore, the ASME Code-required 100 percent volumetric examination is considered impractical.

To effectively evaluate the licensee's proposed alternative, the NRC staff requested additional information from the licensee regarding past inspections of this boron injection tank head circumferential weld. In the December 8, 2010, letter, the licensee has stated that at the time of the last inspection (1989), the same physical limitations were noted and 39 percent UT coverage was reported. No indications were detected during that 1989 inspection. The only difference between the 1989 and the 2009 inspections was that the ultrasonic examination of the welds in 2009 was conducted using PDI qualified personnel and procedures in accordance with ASME Code, Section XI, Appendix VIII.

The licensee has shown that it is impractical to meet the ASME Code-required volumetric examination coverage for the subject weld due to the unique design configuration of the tank. Based on the examination performed, along with the examination of pressure retaining welds in other ASME Code, Section XI, Class 2 vessels, it is concluded that if significant service-induced degradation were occurring in the subject welds, there is reasonable assurance that evidence of it would have been detected. As such, the NRC staff further concludes that there is reasonable

assurance of structural integrity of the subject welds based on the examination that has been performed.

RHR Circumferential Pipe Weld 2-2532-6

The ASME Code requires 100 percent volumetric examination of selected ASME Code, Section XI, Examination Category C-F-1 pressure retaining circumferential piping welds. The volumetric examination must be applied from both sides of the weld to maximize coverage. However, for Weld 2-2532-6, volumetric examination was limited by the geometry of the weld. To gain access for examination, modifications to the component would be required. Imposition of this requirement would create a burden on the licensee; therefore, the ASME Code-required 100 percent volumetric examinations from both sides of the welds are considered impractical.

Weld 2-2532 is a flange to pipe weld. 100 percent coverage was obtained on the circumferential scans. However, for the axial scans, 100 percent coverage was only obtained from the pipe side of the weld, with no coverage for an axial scan possible from the flange side of the weld. Therefore, as shown on the sketches and technical descriptions included in the licensee's submittal, examination of the subject weld has been performed to the extent practical with the licensee obtaining volumetric coverage of 75 percent. The licensee's UT technique which included 45-degree shear waves, and 60-degree refracted longitudinal waves (L-waves) has been shown to provide enhanced detection on the far-side of austenitic stainless steel welds[4,5]. The UT techniques employed for this examination was qualified in accordance with ASME Code, Section XI, Appendix VIII, Supplement 2 through industry's PDI Program. There were no unacceptable indications found during the inspection of this weld.

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 its geometric configuration. Although the ASME Code-required coverage could not be obtained, the UT techniques 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 weld. Based on the aggregate coverage obtained for Weld 2-2532-6, 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 volumetric examinations that were performed. Furthermore, the staff determined that the examinations performed to the extent practical on the subject weld provide reasonable assurance of structural integrity of the subject welds.

Safety Injection Circumferential Pipe Weld 2-2546-3

The ASME Code requires 100 percent volumetric examination of selected ASME Code, Section XI, Examination Category C-F-1 pressure retaining circumferential piping welds. The volumetric examination must be applied from both sides of the weld to maximize coverage. However, for Weld 2-2546-3, volumetric examination was limited by the geometry of the component. To gain

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4 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.

5 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.

access for examination, modifications to the component would be required. Imposition of this requirement would create a burden on the licensee; therefore, the ASME Code-required 100 percent volumetric examination from both sides of the weld is considered impractical.

Weld 2-2532 is a reducer to pipe weld. 100 percent coverage was obtained on the circumferential scans. However, for the axial scans, 100 percent coverage was only obtained from the pipe side of the weld, with no coverage for an axial scan possible from the reducer side of the weld. Therefore, as shown on the sketch and technical descriptions included in the licensee's submittal, examination of the subject weld has been performed to the extent practical with the licensee obtaining volumetric coverage of 75 percent. The licensee's UT technique used 45-and 60- and 70-degree shear waves. The UT technique employed for this examination was qualified in accordance with ASME Code, Section XI, Appendix VIII, Supplement 2 through industry's PDI Program. There were no unacceptable indications found during the inspection of this weld

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 its geometric configuration. Although the ASME Code-required coverage could not be obtained, the UT technique 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 weld. Based on the aggregate coverage obtained for Weld 2-2546-3, and considering the licensee's performance of a UT technique 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 volumetric examination that was performed. Furthermore, the staff determined that the examination performed to the extent practical on the subject weld provides reasonable assurance of structural integrity of the subject welds.

4.0 CONCLUSION

Based on the discussion above, the NRC staff concludes that:

(1) The ASME Code examination coverage requirements are impractical for the subject welds listed in Relief Requests RR-3-49 and RR-3-50.
(2) Based on the volumetric coverage obtained, if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would have been detected by the examinations that were performed.
(3) The examinations performed provide reasonable assurance of structural integrity of the subject welds.
(4) No additional requirements in conjunction with the Relief Requests RR-3-49 and RR-3-50, are required.
(5) The licensee's application for the relief pursuant to 10 CFR 50.55a(g)(5)(iii) and granting relief for Relief Requests RR-3-49 and RR-3-50, pursuant 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.

Therefore, for the items listed in Relief Requests RR-3-49 and RR-3-50, the relief is hereby granted for RR-3-49 and RR-3-50, pursuant to 10 CFR 50.55a(g)(6)(i), for the Third 10-year ISI interval at IP 3 which began on July 21, 2000, and ended on July 20, 2009.

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

Principal Contributors: C. Nove, NRR/DCI/CVIB
P. Purtscher, NRR/DCI/CPNB

Date: April 25, 2011

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

If you have any questions, please contact the Indian Point Senior Project Manager, John Boska, at (301) 415-2901.

Sincerely,

/ra/

Nancy L. Salgado, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-286

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