March 29, 2007

Mr. Christopher M. Crane
President and Chief Nuclear Officer
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BYRON STATION, UNIT NOS. 1 AND 2 - REQUESTS FOR RELIEF FROM THE ASME CODE REQUIREMENTS FOR THE THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN (TAC NOS. MD3661, MD3662, AND MD3663)

Dear Mr. Crane:

By letter dated October 26, 2006, Exelon Generating Company, LLC (the licensee) submitted Relief Requests I3R-09 and I3R-10 for Nuclear Regulatory Commission (NRC) approval. For relief request I3R-09, the licensee proposed the use of an alternate flaw depth sizing tolerance at Byron Station (Byron), Unit No. 2, when performing ultrasonic examinations of dissimilar metal welds from the inside surface of piping. For Relief Request I3R-10, the licensee proposed the use of the Performance Demonstration Initiative (PDI) program developed by the Electric Power Research Institute (EPRI) for the examination of dissimilar metal welds at Byron, Unit Nos. 1 and 2, as an alternative to the requirements specified in the American Society of Mechanical Engineers, Boiler and Pressure Vessel Code (ASME Code), Section XI, Appendix VIII, Supplement 10, "Qualification Requirements for Dissimilar Metal Piping Welds," hereafter called "Supplement 10."

The NRC staff concludes that requiring the licensee to qualify procedures, personnel, and equipment to meet the maximum error of 0.125 inch root mean square error (RMSE) for crack depth sizing is not feasible at the present time. The licensee's proposed alternative, as described in Relief Request I3R-09, of adding the difference between the ASME Code-required RMSE and the demonstrated accuracy to the measurements acquired from flaw sizing of the subject dissimilar metal welds, in addition to the use of the acceptance standards specified in IWB-3500 of the ASME Code, provides an acceptable level of quality and safety. Therefore, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i), the licensee's proposed alternative is authorized for the remainder of the third 10-year ISI interval at Byron, Unit 2.

In addition, for Relief Request I3R-10, the NRC staff concludes that the licensee's proposed alternatives to the ASME Code, Section XI, Appendix VIII, Supplement 10, as administered by the EPRI-PDI program, provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the use of the proposed alternatives as described in the licensee's letter dated October 26, 2006, is authorized for the remainder of the third 10-year ISI intervals for Byron, Unit Nos. 1 and 2.

The NRC staff's safety evaluation is enclosed. If you have any question, please contact Mr. Christopher Gratton of my staff at (301) 415-1055.

Sincerely,

/RA/

Russell A. Gibbs, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-454 and STN 50-455

Enclosure:
Safety Evaluation

cc w/encl: See next page

The NRC staff safety evaluation is enclosed. If you have any question, please contact Mr. Christopher Gratton of my staff at (301) 415-1055.

Sincerely,

/RA/

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Docket Nos. STN 50-454 and STN 50-455

Enclosure:
Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO RELIEF REQUEST NOS. I3R-09 AND I3R-10

THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN

EXELON GENERATION COMPANY, LLC

BYRON STATION, UNIT NOS. 1 AND 2

DOCKET NOS. STN 50-454 AND STN 50-455

1.0 INTRODUCTION

By letter dated October 26, 2006, Exelon Generating Company, LLC (the licensee) submitted Relief Requests I3R-09 and I3R-10 for Nuclear Regulatory Commission (NRC, the Commission) approval. For Relief Request I3R-09, the licensee proposed the use of an alternate flaw depth sizing tolerance at Byron Station (Byron), Unit No. 2 when performing ultrasonic examinations of dissimilar metal welds from the inside surface of piping. For Relief Request I3R-10, the licensee proposed the use of the Performance Demonstration Initiative (PDI) program developed by the Electric Power Research Institute (EPRI) for the examination of dissimilar metal welds at Byron, Unit Nos. 1 and 2, in lieu of that specified in American Society of Mechanical Engineers, Boiler and Pressure Vessel Code (ASME Code), Section XI, Appendix VIII, Supplement 10, "Qualification Requirements for Dissimilar Metal Piping Welds." The subject relief requests will be used for inservice inspection (ISI) in the remainder of the third 10-year interval, which ends July 15, 2016.

2.0 REGULATORY REQUIREMENTS

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g) specifies that ISI of nuclear power plant components shall be performed in accordance with the requirements of the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (i) the proposed alternatives would provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

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, 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. The applicable ASME Code of record for the third 10-year ISI at Byron, Unit Nos. 1 and 2 is the 2001 Edition through the 2003 Addenda.

The information provided by the licensee in support of the request has been evaluated by the NRC staff and the bases for disposition are documented below.

3.0 TECHNICAL EVALUATION

3.1 Relief Request I3R-09

3.1.1 Components for Which Relief is Requested

Code Class 1, Pressure Retaining Dissimilar Metal Welds - Reactor Vessel Nozzle-to-Safe End Welds, subject to examinations using procedures, personnel, and equipment qualified to the 1995 Edition with the 1996 Addenda of the ASME Code, Section XI, Appendix VIII, Supplement 10, as identified below.

Unit 2 Nozzle-to-Safe End Welds

Description	Weld Number	RI-ISI ITEM NO.	ASME XI ITEM NO.
RPV Nozzle to Safe End Hot Leg Loop D	1RC-01-R/RPVS-A/F1	R1.15	B5.10
RPV Nozzle to Safe End Cold Leg Loop D	1RC-01-R/RPVS-B/F1	R1.15	B5.10
RPV Nozzle to Safe End Hot Leg Loop C	1RC-01-R/RPVS-C/F1	R1.15	B5.10
RPV Nozzle to Safe End Cold Leg Loop C	1RC-01-R/RPVS-D/F1	R1.15	B5.10
RPV Nozzle to Safe End Hot Leg Loop B	1RC-01-R/RPVS-E/F1	R1.15	B5.10
RPV Nozzle to Safe End Cold Leg Loop B	1RC-01-R/RPVS-F/F1	R1.15	B5.10
RPV Nozzle to Safe End Hot Leg Loop A	1RC-01-R/RPVS-G/F1	B1.15	B5.10
RPV Nozzle to Safe End Cold Leg Loop A	1RC-01-R/RPVS-H/F1	B1.15	B5.10

3.1.2 Applicable Code Edition and Addenda

The ASME Code of record for the third 10-year ISI program at Byron, Unit No. 2, is the 2001 Edition through the 2003 Addenda. Ultrasonic examination of applicable Class 1 and 2 components is governed by Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," of the ASME Code, Section XI, the 1995 Edition with the 1996 Addenda.

3.1.3 Applicable Code Requirement

For the subject dissimilar metal piping welds, the ASME Code requires that volumetric examinations are to be performed in accordance with Section XI, Appendix VIII, Supplement 10. For sizing acceptance criteria, Paragraph 3.2(a) of Supplement 10 requires that examination procedures, equipment, and personnel be qualified for depth sizing when the root mean square error (RMSE) of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 inches.

3.1.4 Licensee Proposed Alternative and Basis for Use

The licensee stated that a request for relief from the required RMSE in depth sizing is needed because the contracted vendor for ultrasonic test (UT) examination did not meet the qualification requirement for depth sizing. The contracted vendor has demonstrated the ability to meet the depth sizing qualification requirement with a RMSE of 0.189 inches instead of the required 0.125 inches. The RMSE of 0.189 inch is based on actual vendor demonstrated, in-process, field qualifications and is the optimum value that could be achieved from the inside surface of the pipe.

The proposed procedure to address sizing of the flaws that may be detected during the examination is to add the difference between the 0.189-inch achieved sizing error and the 0.125-inch RMSE Appendix VIII, Supplement 10 acceptance criteria to the measured flaw size. The licensee stated that the use of this difference (0.064 inch) as an adjustment to the measured flaw will ensure a conservative bounding depth value for dissimilar metal welds at Byron, Unit No. 2.

3.1.5 Staff Evaluation

ASME Code, Section XI, Appendix VIII, Supplement 10 requires that in the qualification of examination procedures, equipment, and personnel for ultrasonic examination of dissimilar metal piping welds, the RMSE in flaw depth sizing does not exceed 0.125 inches. The licensee's contracted inspection vendor did not meet this requirement. The contracted vendor has demonstrated a RMSE of 0.189 inches in depth sizing instead of the required 0.125 inches. The nuclear industry is in the process of qualifying personnel in accordance with the Supplement 10 requirements, as implemented through the PDI program. At present, the PDI program has been unsuccessful in qualifying personnel to meet the required RMSE value for flaw depth sizing performed from the inside surface of pipe weldment mockup samples. Therefore, having the licensee meet the RMSE value of 0.125 inches in the qualification examination is not feasible at the present time.

To compensate for the larger RMSE in flaw sizing, the licensee proposed to add 0.064 inches to the measured flaw depth, which equates to the difference between the demonstrated sizing error and the ASME Code-required RMSE of 0.125 inches. The NRC staff has determined that this approach provides an acceptable level of quality and safety because it provides a conservative adjustment to the measured flaw depth in the flaw evaluation to compensate for the inability to have the licensee qualify procedures, personnel, and equipment to meet the maximum error of 0.125 inch RMSE for crack depth sizing.

3.1.6 Conclusion

Based on the above evaluation, the NRC staff has determined that requiring the licensee to qualify procedures, personnel, and equipment to meet the maximum error of 0.125 inch RMSE for crack depth sizing is not feasible at the present time. The licensee's proposed alternative of adding the difference between the ASME Code-required RMSE and the demonstrated accuracy to the measurements acquired from flaw sizing of the subject dissimilar metal welds, provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the licensee's proposed alternative is authorized for the remainder of the third 10-year ISI interval at Byron, Unit No. 2.

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

3.2 Relief Request I3R-10

3.2.1 Components for Which Relief is Requested

All ASME Code Class 1 dissimilar metal piping welds.

3.2.2 Applicable Code Edition and Addenda

The ASME Code of record for the third 10-year ISI program at Byron, Unit Nos. 1 and 2, is the ASME Code, Section XI, the 2001 Edition through the 2003 Addenda. Ultrasonic examination of applicable Class 1 and 2 components is governed by Appendix VIII, of the ASME Code, Section XI, the 1995 Edition with the 1996 Addenda.

3.2.3 Applicable Code Requirement

The ASME Code requires that the procedures, equipment and personnel used for the ultrasonic examination of the referenced dissimilar metal piping welds be qualified to the ASME Code, Section XI, Appendix VIII, Supplement 10.

The following paragraphs or statements are from the ASME Code, Section XI, Appendix VIII, Supplement 10, and identify the specific requirements that are applicable to this request for relief.

> Item 1 - Paragraph 1.1(b) states in part - Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter shall be considered equivalent.

Item 2 - Paragraph 1.1(d) states - All flaws in the specimen set shall be cracks.

Item 3 - Paragraph 1.1(d)(1) states - At least 50% of the cracks shall be in austenitic material. At least 50% of the cracks in austenitic material shall be contained wholly in weld or buttering material. At least 10% of the cracks shall be in ferritic material. The remainder of the cracks may be in either austenitic or ferritic material.

Item 4 - Paragraph 1.2(b) states in part - The number of unflawed grading units shall be at least twice the number of flawed grading units.

Item 5 - Paragraph 1.2(c)(1) and 1.3(c) state in part - At least 1/3 of the flaws, rounded to the next higher whole number, shall have depths between 10% and 30% of the nominal pipe wall thickness. Paragraph 1.4(b) distribution table requires 20% of the flaws to have depths between 10% and 30%.

Item 6 - Paragraph 2.0 first sentence states - The specimen inside surface and identification shall be concealed from the candidate.

Item 7 - Paragraph 2.2(b) states in part - The regions containing a flaw to be sized shall be identified to the candidate.

Item 8 - Paragraph 2.2(c) states in part - For a separate length sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate.

Item 9 - Paragraph 2.3(a) states - For the depth sizing test, 80% of the flaws shall be sized at a specific location on the surface of the specimen identified to the candidate.

Item 10 - Paragraph 2.3(b) states - For the remaining flaws, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.

Item 11 - Table VIII-S2-1 provides the false call criteria when the number of unflawed grading units is at least twice the number of flawed grading units.

3.2.4 Licensee Proposed Alternative and Basis for Use

The licensee proposed the following alternatives to the ASME Code, Section XI, Appendix VIII, Supplement 10, requirements during the remainder of the third 10-year ISI interval for the Byron, Unit Nos. 1 and 2. The proposed alternatives, as stated by the licensee, will be implemented through the PDI program.

Item 1 - The proposed alternative to Paragraph 1.1(b) states:

“The specimen set shall include the minimum and maximum pipe diameters and thicknesses for which the examination procedure is applicable. Pipe diameters within a range of ½ in. (13 mm) of the nominal diameter shall be

considered equivalent. Pipe diameters larger than 24 in. (610 mm) shall be considered to be flat. When a range of thicknesses is to be examined, a thickness tolerance of ± 25% is acceptable."

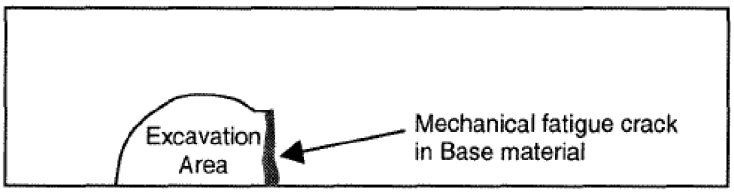
Technical Basis - The change in the minimum pipe diameter tolerance from 0.9 times the diameter to the nominal diameter minus 0.5 inch provides tolerances more in line with industry practice. Though the alternative is less stringent for small pipe diameters, they typically have a thinner wall thickness than larger diameter piping. A thinner wall thickness results in shorter sound path distances that reduce the detrimental effects of the curvature. This change maintains consistency between Supplement 10 and the recent revision to Supplement 2.

Item 2 - The proposed alternative to Paragraph 1.1(d) states:

"At least 60% of the flaws shall be cracks, the remainder shall be alternative flaws. Specimens with [intergranular stress corrosion cracking] IGSCC shall be used when available. Alternative flaws, if used, shall provide crack-like reflective characteristics and shall be limited to the case where implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws. Alternative flaw mechanisms shall have a tip width of less than or equal to 0.002 in. (.05 mm)."

Technical Basis - As illustrated below, implanting a crack requires excavation of the base material on at least one side of the flaw. While this may be satisfactory for ferritic materials, it does not produce a useable axial flaw in austenitic materials because the sound beam, which normally passes only through base material, must now travel through weld material on at least one side, producing an unrealistic flaw response. In addition, it is important to preserve the dendritic structure present in field welds that would otherwise be destroyed by the implantation process. To resolve these issues, the proposed alternative allows the use of up to 40% fabricated flaws as an alternative flaw mechanism under controlled conditions. The fabricated flaws are isostatically compressed which produces ultrasonic reflective characteristics similar to tight cracks.

To avoid confusion the proposed alternative modifies instances of the term "cracks" or "cracking" to the term "flaws" because of the use of "alternative flaw mechanisms."



Item 3 - The proposed alternative to Paragraph 1.1 (d)(1) states:

"At least 80% of the flaws shall be contained wholly in weld or buttering material. At least one and a maximum of 10% of the flaws shall be in ferritic base material. At least one and a maximum of 10% of the flaws shall be in austenitic base material."

Technical Basis - Under the current [ASME] Code, as few as 25% of the flaws are contained in austenitic weld or buttering material. The metallurgical structure of austenitic weld material is ultrasonically more challenging than either ferritic or austenitic base material. The proposed alternative is therefore more challenging than the current [ASME] Code.

Item 4 - The proposed alternative to Paragraph 1.2(b) states:

"Detection sets shall be selected from Table VIII-S10-1. The number of unflawed grading units shall be at least one and a half times the number of flawed grading units."

Technical Basis - New Table VIII-S10-1 provides a statistically based ratio between the number of unflawed grading units and the number of flawed grading units. Based on information provided by the PDI, the proposed alternative reduces the ratio to 1.5 times to reduce the number of test samples to a more reasonable number. However, the statistical basis used for screening personnel and procedures is still maintained at the same level with competent personnel being successful and less skilled personnel being unsuccessful. The acceptance criteria for the statistical basis are in Table VIII-S10-1.

Item 5 - The proposed alternative to the flaw distribution requirements of Paragraph 1.2(c)(1) (detection) and 1.3(c) (length) is to use the Paragraph 1.4(b) (depth) distribution table (see below) for all qualifications.

Flaw Depth (% Wall Thickness)	Minimum Number of Flaws
10-30%	20%
31-60%	20%
61-100%	20%

Technical Basis - The proposed alternative uses the depth sizing distribution for both detection and depth sizing because it provides for a better distribution of flaw sizes within the test set. This distribution allows candidates to perform detection, length, and depth sizing demonstrations simultaneously utilizing the same test set. The requirement that at least 75% of the flaws shall be in the range of 10 to 60% of wall thickness provides an overall distribution tolerance yet the distribution uncertainty decreases the possibilities for testmanship that would be inherent to a uniform distribution. It must be noted that it is possible to achieve the same

distribution utilizing the present requirements, but it is preferable to make the criteria consistent.

Item 6 - The proposed alternative to Paragraph 2.0 first sentence states:

"For qualifications from the outside surface, the specimen inside surface and identification shall be concealed from the candidate. When qualifications are performed from the inside surface, the flaw location and specimen identification shall be obscured to maintain a "blind test"."

Technical Basis - The current [ASME] Code requires that the inside surface be concealed from the candidate. This makes qualifications conducted from the inside of the pipe (e.g., [pressurized-water reactor] PWR nozzle to safe end welds) impractical. The proposed alternative differentiates between [inner diameter] ID and [outer diameter] OD scanning surfaces, requires that they be conducted separately, and requires that flaws be concealed from the candidate.

Items 7 and 8 - The proposed alternatives to Paragraph 2.2(b) and 2.2(c) state:

"... containing a flaw to be sized may be identified to the candidate."

Technical Basis - The current [ASME] Code requires that the regions of each specimen containing a flaw to be length sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region (note that length and depth sizing use the term "regions" while detection uses the term "grading units"). To ensure security of the samples, the proposed alternative modifies the first "shall" to a "may" to allow the test administrator the option of not identifying specifically where a flaw is located.

Items 9 and 10 - The proposed alternative to Paragraph 2.3(a) and 2.3(b) state:

"... regions of each specimen containing a flaw to be sized may be identified to the candidate."

Technical Basis - The current [ASME] Code requires that a large number of flaws be sized at a specific location. The proposed alternative changes the "shall" to a "may" which modifies this from a specific area to a more generalized region to ensure security of samples.

Item 11 - The proposed alternative modifies the acceptance criteria of Table VIII-S2-1 as follows:

10

TABLE VIII-S2-1
PERFORMANCE DEMONSTRATION DETECTION TEST ACCEPTANCE CRITERIA

Detection Test Acceptance Critera		False Call Test Acceptance Criteria	
No. of Flawed Grading Units	Minimum Detection Criteria	No. of Unflawed Grading Units	Maximum Number of False Calls
~~5~~	~~5~~	~~10~~	~~0~~
~~6~~	~~6~~	~~12~~	~~1~~
~~7~~	~~6~~	~~14~~	~~1~~
~~8~~	~~7~~	~~16~~	~~2~~
~~9~~	~~7~~	~~18~~	~~2~~
10	8	~~20~~ 15	~~3~~ 2
11	9	~~22~~ 17	~~3~~ 3
12	9	~~24~~ 18	~~3~~ 3
13	10	~~26~~ 20	~~4~~ 3
14	10	~~28~~ 21	~~5~~ 3
15	11	~~30~~ 23	~~5~~ 3
16	12	~~32~~ 24	~~6~~ 4
17	12	~~34~~ 26	~~6~~ 4
18	13	~~36~~ 27	~~7~~ 4
19	13	~~38~~ 29	~~7~~ 4
20	14	~~40~~ 30	~~8~~ 5

Technical Basis - The proposed alternative adds new Table VIII-S10-1 above. It is a modified version of Table VIII-S2-1 to reflect the reduced number of unflawed grading units and allowable false calls. As provided by the PDI, as a part of ongoing [ASME] Code activities, Pacific Northwest National Laboratory has reviewed the statistical significance to this new Table VIII-S10-1.

3.2.5 Staff Evaluation

The licensee proposed to use the program developed by PDI that is similar to the ASME Code requirements. The differences between the ASME Code and the PDI program are discussed and evaluated below.

Item 1 - Paragraph 1.1(b)

The ASME Code requirement of “0.9 to 1.5 times the nominal diameter are equivalent” was established for a single nominal diameter. When applying the ASME Code-required tolerance to a range of diameters, the tolerance rapidly expands on the high side. Under current code requirements, a 5-inch outside diameter (OD) pipe (4.5 inch nominal pipe size (NPS)) would be equivalent to a range of 4.5-inch to 7.5-inch nominal pipe diameter. Under the proposed PDI guidelines, the equivalent range would be reduced to 4.5-inch to 5.5-inch nominal diameter. With current ASME Code requirements, a 16-inch nominal diameter pipe (16-inch NPS) would be equivalent to a range of 14.4-inch to 24-inch. The proposed PDI guidelines would significantly reduce the equivalent range to 15.5-inch to 16.5-inch. The difference between the ASME Code and the proposed PDI program for diameters less than 5 inches is not significant because of a shorter metal path and beam spread associated with smaller diameter piping.

The NRC staff considers the proposed alternative to be more conservative overall than current ASME Code requirements. Consequently, the NRC staff finds that the proposed alternative will provide an acceptable level of quality and safety, and therefore, is acceptable.

Item 2 - Paragraph 1.1(d)

The ASME Code requires all flaws to be cracks. Manufacturing test specimens containing cracks free of spurious reflections and telltale indicators is extremely difficult in austenitic material. To overcome these difficulties, PDI developed a process for fabricating flaws that produce UT acoustic responses similar to the responses associated with real cracks. PDI presented its process for discussion at public meetings held June 12 through 14, 2001, and January 31 through February 2, 2002, at the EPRI Nondestructive Examination Center, Charlotte, NC. The NRC staff attended these meetings and determined that the process parameters used for manufacturing fabricated flaws resulted in acceptable acoustic responses. PDI is selectively installing these fabricated flaws in specimen locations that are unsuitable for real cracks. As such, the NRC staff agrees that the acoustic responses of the fabricated flaws are sufficiently similar to those of real cracks to provide test conditions that are consistent with the purpose of the ASME Code requirements. Consequently, the NRC staff finds that the proposed alternative will provide an acceptable level of quality and safety, and therefore, is acceptable.

Item 3 - Paragraph 1.1(d)(1)

The ASME Code requires that at least 50 percent of the flaws be contained in austenitic material, and 50 percent of the flaws in the austenitic material shall be contained fully in weld or buttering material. This means that at least 25 percent of the total flaws must be located in the weld or buttering material. Field experience shows that flaws identified during ISI of dissimilar metal welds are more likely to be located in the weld or buttering material. The grain structure of austenitic weld and buttering material represents a much more stringent ultrasonic scenario than that of a ferritic material or austenitic base material. Flaws made in austenitic base material are difficult to create free of spurious reflectors and telltale indicators. The proposed alternative of 80 percent of the flaws in the weld metal or buttering material provides a challenging testing scenario reflective of field experience and minimizes testmanship associated with telltale reflectors common to placing flaws in austenitic base material. As a result, the NRC staff considers the proposed alternative to be more conservative than current ASME Code requirements. Consequently, the NRC staff finds that the proposed alternative will provide an acceptable level of quality and safety, and therefore, is acceptable.

Item 4 - Paragraph 1.2(b) and Item 11 - Table VIII-S2-1 Acceptance Criteria

The ASME Code requires that detection sets meet the requirements of Table VIII-S2-1, which specifies the minimum number of flaws in a test set to be five with 100 percent detection. The current ASME Code also requires the number of unflawed grading units to be two times the number of flawed grading units. The proposed alternative would follow the detection criteria of the table beginning with a minimum number of flaws in a test set being 10, and reducing the number of unflawed grading units to one and a half times the number of flawed grading units.

The maximum number of allowable false calls is also reduced in order to maintain the statistical basis for the pass/fail criteria. Because this statistical basis is maintained, the NRC staff has

determined that the proposed alternative satisfies the pass/fail objective established for Appendix VIII performance demonstration. Consequently, the NRC staff finds that the proposed alternative will provide an acceptable level of quality and safety, and therefore, is acceptable.

Item 5 - Paragraphs 1.2(c)(1) and 1.3(c)

For detection and length sizing, the ASME Code requires that at least one-third of the flaws be located between 10 and 30 percent through the wall thickness, and one-third located greater than 30 percent through the wall thickness. The remaining flaws would be located randomly throughout the wall thickness. The proposed alternative sets the distribution criteria for detection and length sizing to be the same as the depth sizing distribution, which stipulates that at least 20 percent of the flaws be located in each of the increments of 10 to 30 percent, 31 to 60 percent, and 61 to 100 percent. The remaining 40 percent would be located randomly throughout the pipe thickness. With the exception of the 10 to 30 percent increment, the proposed alternative is a subset of current ASME Code requirements. The 10 to 30 percent increment would be in the subset if it contained at least 30 percent of the flaws. The change simplifies assembling test sets for detection and sizing qualifications and is more indicative of conditions in the field. Consequently, the NRC staff finds that the proposed alternative will provide an acceptable level of quality and safety, and therefore, is acceptable.

Item 6 - Paragraph 2.0

The ASME Code requires that the specimen's inside surface be concealed from the candidate. This requirement is applicable for test specimens used for qualifications performed from the outside surface. With the expansion of the ASME Code, Section XI, Appendix VIII, Supplement 10, to include qualifications performed from the inside surface, the inside surface must be accessible while maintaining the specimen integrity. The proposed alternative requires that flaws and specimen identifications be obscured from candidates, thus maintaining blind test conditions. The NRC staff considers this to be consistent with the intent of ASME Code requirements. Consequently, the NRC staff finds that the proposed alternative will provide an acceptable level of quality and safety, and therefore, is acceptable.

Items 7 and 8 - Paragraphs 2.2(b) and 2.2(c)

The ASME Code requires that the location of flaws added to the test set for length sizing be identified to the candidate. The proposed alternative is to make identifying the location of additional flaws an option. This option provides an additional element of difficulty to the testing process because the candidate would be expected to demonstrate the skill of detecting and sizing flaws over an area larger than a specific location. The staff considers the proposed alternative to be more conservative than current ASME Code requirements. Consequently, the NRC staff finds that the proposed alternative will provide an acceptable level of quality and safety, and therefore, is acceptable.

Items 9 and 10 - Paragraphs 2.3(a) and 2.3(b)

In paragraph 2.3(a), the ASME Code requires that 80 percent of the flaws be sized in a specific location that is identified to the candidate. The proposed alternative allows identification of the specific location to be an option. This permits detection and depth sizing to be conducted separately or concurrently. In order to maintain a blind test, the location of flaws cannot be shared with the candidate. For depth sizing that is conducted separately, allowing the test administrator the option of not identifying flaw locations makes the testing process more challenging. The NRC staff considers the proposed alternative to be more conservative than current ASME Code requirements. Consequently, the NRC staff finds that the proposed alternative will provide an acceptable level of quality and safety, and therefore, is acceptable.

In paragraph 2.3(b), the ASME Code also requires that the location of flaws added to the test set for depth sizing be identified to the candidate. The proposed alternative is to make identifying the location of additional flaws an option. This option provides an additional element of difficulty to the testing process because the candidate would be expected to demonstrate the skill of finding and sizing flaws in an area larger than a specific location. The NRC staff considers the proposed alternative to be more conservative than ASME Code requirements. Consequently, the NRC staff finds that the proposed alternative will provide an acceptable level of quality and safety and, therefore, is acceptable.

Item 11 - Table VIII-S2-1 Acceptance Criteria

The licensee revised Table VIII-S2-1 to incorporate the changes that were discussed and evaluated in Item 4. The NRC staff reviewed the changes to the table and conclude that they are consistent with the changes found to be acceptable under Item 4.

3.2.6 Conclusion

The NRC staff concludes that the licensee's proposed alternatives to the ASME Code, Section XI, Appendix VIII, Supplement 10, as administered by the PDI program, provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the use of the proposed alternatives as described in the licensee's letter dated October 26, 2006, is authorized for the remainder of the third 10-year ISI intervals for Byron, Unit Nos. 1 and 2.

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

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