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

March 1, 2013

Mr. Richard L. Anderson
Vice President
Duane Arnold Energy Center
3277 DAEC Road
Palo, IA 52324-9785

SUBJECT: DUANE ARNOLD ENERGY CENTER - RELIEFS FROM THE REQUIREMENTS OF THE ASME BOILER AND PRESSURE VESSEL CODE FOR THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL (TAC NO. ME7246)

Dear Mr. Anderson:

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated August 31, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML11245A240, as supplemented by letter dated December 21, 2012 (ADAMS Accession No. ML12356A185) and an email message dated February 19, 2013 (ADAMS Accession No. ML13051A049), NextEra Energy Duane Arnold, LLC (hereinafter referred to as the licensee) submitted a fourth 10-year inservice inspection (ISI) plan[1] for the Duane Arnold Energy Center (DAEC), which contained 15 previously approved relief requests (listed in Enclosure 1), among which the licensee requested a time extension to a full 10 years of effectiveness from February 21, 2014, to October 31, 2016, as described in a table shown in Enclosure 1.

In its supplements dated December 21, 2012, and February 19, 2013, the licensee clarified the needed actions at this time since the status on some of the requested reliefs described in its application letter dated August 31, 2011 had evolved. The table in Enclosure 1 is in response to the licensee's table in Section H, Page 1 of 100, of its letter dated August 31, 2011, as revised by the table in its letter dated December 21, 2012, and additional information provided for Relief Request (RR) (nondestructive examination) (NDE)-R009 in its email message dated February 19, 2013.

The NRC staff has completed its review of the relief requests listed in Enclosure 1 as documented in the enclosed Safety Evaluation (Enclosure 2). NRC staff concludes the following:

The listed RRs are authorized until October 31, 2016, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) by either 10 CFR Sections 50.55a(a)(3)(i), 55a(a)(3)(ii), or 50.55a(g)(6)(i), as detailed in Enclosure 2: RRs NDE-R001, R002, R003, R005, R006, R007, R008, R009, R010, R012, R013.

[1] The DAEC fourth 10-year ISI plan was scheduled to end with the expiration of the original operating license on February 21, 2014. On December 16, 2010, the DAEC operating license was extended to February 21, 2034. Consequently, the licensee requested that the current fourth 10-year ISI interval for DAEC be extended for the full 10-year period, extending the end of the fourth 10-year ISI interval to October 31, 2016.

1. RR NDE-R004 is no longer needed.

2. Time extensions for the following RRs are not needed: RRs NDE-R011, R014, R015 in Enclosure 1 are essentially extensions for reliefs that have been granted previously. The NRC staff review of the licensee's submittal found that the relevant information was identical to information provided in the previous relief requests. The NRC staff review also determined that no relevant issues have emerged since the previous safety evaluations that would affect the relief granted earlier. Therefore, the NRC staff concludes that the licensee's relief requests listed in Enclosure 1 and remaining in effect, are acceptable and provide an acceptable level of quality and safety.

All other American Society of Mechanical Engineers and Boiler and Pressure Vessel Code, Section XI, requirements for which relief was not specifically requested and approved remain applicable, including third-party review by the authorized Nuclear Inservice Inspectors.

If you have any questions, please contact the Project Manager, Karl Feintuch at 301-415-3079 or via e-mail at Karl.Feintuch@nrc.gov

Sincerely,

Robert D. Carlson, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-331

Enclosures:
1. Relief Requests Summary
2. Safety Evaluation

cc w/encl: Distribution via ListServ

Enclosure 1: Relief Requests Summary

The licensee submitted the requests listed below for relief from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code (Code), Section XI requirements at the DAEC. The subject Relief Requests were previously submitted by the licensee and approved by NRC in accordance with 10 CFR 50.55a(a)(3) and 10 CFR 50.55a(g)(6). By letter dated August 31, 2011, the licensee requested an extension of the duration of selected Relief Requests to the end of the 4th full 10 year interval.

Relief Request Identifier	***Short Description***	*Original Relief Request Details*			***Action authorized under TAC ME7246***
		Approval Date	***Safety Evaluation ADAMS Accession No.***	***TAC***	
NDE-R001	Use of the DAEC Technical Requirements Manual for snubber visual examination & testing	1/31/2007	ML070090357	MD2517	Extend authorization to 10/31/2016 (end of 4th 10-year interval)
NDE-R002	Approved use of PDI for overlays in lieu of Supplement 11 to Appendix VIII	1/31/2007	ML070090357	MD2518	Extend authorization to 10/31/2016 (end of 4th 10-year interval)
NDE-R003	Requested to use BWRVIP-05 recommendations for reduced circumferential vessel weld exams	1/6/2005	ML043270051	MC2181	Extend authorization to 10/31/2016 (end of 4th 10-year interval)
NDE-R004	Request use of ASME Code Case N-700 in lieu of the requirements specified in the ASME Code, Section XI for Class 1, 2, and 3 vessel welded attachments	6/12/2007	ML071380183	MD2520	This relief is no longer required since Code Case N-700 has been incorporated into RG 1.147.
NDE-R005	Risk-Informed ISI for Class 1 B-F & B-J welds and Class 2 C-F-2 welds	1/31/2007	ML070090357	MD2521	Extend authorization to 10/31/2016 (end of 4th 10-year interval)
NDE-R006	Request use of Code Case N-686 alternate requirements for visual examinations	1/31/2007	ML070090357	MD2522	Extend authorization to 10/31/2016 (end of 4th 10-year interval)
NDE-R007	Alternative for pressure testing and visual examination of buried piping and components	6/12/2007	ML071380183	MD2523	Extend authorization to 10/31/2016 (end of 4th 10-year interval)

NDE-R008	Request to use Appendix VIII examinations for reactor vessel-to-flange weld and head-to-flange weld in lieu of the existing requirements to use Section V	1/31/2007	ML070090357	MD2524	Extend authorization to 10/31/2016 (end of 4th 10-year interval)
NDE-R009	Allow use of the provisions of IWA-4132 for stock rotation of recirculation pump seal flange assemblies	10/3/2008	ML082480680	MD3177* followed by MD8192	Extend authorization to 10/31/2016 (end of 4th 10-year interval)
NDE-R010	Limited examination on Welds HCC-CO01, CUA-J024, RMA-J004 (ref NG-09-0539)	6/6/2010	ML101680600	ME1821	Extend authorization to 10/31/2016 (end of 4th 10-year interval)
NDE-R011	Request to use Code Cases N-504-2 and N-638-1 for weld overlay repairs	6/12/2007	ML071110007	MD4466	This relief was for installation of weld overlays on RRC-F002 welds. The weld overlays were installed in 2007, and no work is ongoing that requires additional relief for these welds. No extension of relief was requested
NDE-R012	Request to allow use of post qualifying seal weld procedures for Target Rock valves	7/2/2008	ML081680709	MD6293	Extend authorization to 10/31/2016 (end of 4th 10-year interval)
NDE-R013	Request to use Code Case N-702 for nozzle-to-vessel welds and inner radius sections	8/29/2008	ML082040046	MD8193	Extend authorization to 10/31/2016 (end of 4th 10-year interval)
NDE-R014	Alternative to ASME Section XI requirements to use structural weld overlay repairs as an alternative repair technique (NG-10-0567)	9/6/2011	ML11235A935	ME4984	This relief was for the installation of a weld on RRA-F002A and RRA-J003 welds. The weld overlay was installed in 2010, and no work is ongoing that requires additional relief for these welds. No extension of relief was requested.
NDE-R015	Request for authorization of alternative regarding pressure test requirements	9/6/11	ML11237A105	ME5143	The Relief Request was a one-time-only alternative for PSV 4402 during Refueling Outage (RFO) 22 in 2010. No extension of relief was requested.

* TAC MD3177 for NDE-R009 was established for relief action requested by the licensee's letter dated 9/29/06 (ADAMS Accession No. ML062780201). By letter dated 3/20/07 (ML070890363), the licensee withdrew its request, and TAC MD3177 was closed. Approximately one year later by letter dated 3/28/08 (ML062780201), the licensee requested the action again. TAC MD8192 was opened to process the application. By letter dated 10/3/08 (ML082480680), the NRC authorized the action.

UNITED STATES
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WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUESTS NDE-R001 TO NDE-R015 INCLUSIVE

FOR THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL

NEXTERA ENERGY DUANE ARNOLD, LLC

DUANE ARNOLD ENERGY CENTER

DOCKET NO. 50-331

1.0 INTRODUCTION

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated August 31, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML11245A240, as supplemented by letter dated December 21, 2012 (ADAMS Accession No. ML12356A185), and an email message dated February 19, 2013 (ADAMS Accession No. ML13051A049), NextEra Energy Duane Arnold, LLC (the licensee), requested relief from the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for the fourth 10-year inservice inspection (ISI) program at the Duane Arnold Energy Center (DAEC). The fourth 10-year ISI program contains 15 Relief Requests. This safety evaluation (SE) addresses all Relief Requests (RRs) NDE (nondestructive examination) -R001 to RR NDE-R015 inclusive.

The table in Enclosure 1 contains a list of all of the SEs issued for Relief Requests (RRs) nonedestructive examination (NDE)-R001 to RR NDE-R015, inclusive. The associated application letters and supplements are listed in each SE.

At the time, the DAEC fourth 10-year ISI inspection program was artificially truncated to coincide with the expiration of the original operating license which will end on February 21, 2014. The NRC approved the subject RRs up to February 21, 2014.

On December 16, 2010, the NRC extended the DAEC operating license to February 21, 2034. As a result of the license extension, the fourth 10-year interval is now scheduled to end on October 31, 2016. Therefore, in the August 30, 2011, submittal, the licensee requested that the previously issued SEs be revised to address the entire fourth 10-year ISI interval for DAEC, which began on November 1, 2006, and ends on October 31, 2016.

2.0 REGULATORY REQUIREMENTS

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 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 the 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 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, which was 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.

Paragraph 50.55a(g)(6)(i) in 10 CFR) states that ". . .the Commission will evaluate determinations . . . that [ASME] 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."

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

Pursuant to Section 50.55a(a)(3)(i) (10 CFR), the licensee submitted Relief Requests (RRs) (nondestructive examination (NDE)-R001, R002, R003, R005, R008, R009, R011, R013, R014, and R015. Pursuant to 10 CFR 50.55a(a)(3)(ii), the licensee submitted RRs NDE-R006, R007, and R012. Pursuant to Section 50.55a(g)(6)(i) (10 CFR), the licensee submitted RR NDE-R010. The licensee identified RR NDE-R004 as no longer needed.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the Commission to grant the relief requested by the licensee.

3.0 TECHNICAL EVALUATION

The technical evaluations for each of the RRs, NDE-R001 to NDE-R015, inclusive, are addressed in order:

3.1 RR NDE-R001

By letter dated June 30, 2006, (ADAMS Accession No. ML 061870230), as supplemented by a letter dated December 21, 2006 (Accession No. ML070030516), the licensee submitted RR NDE-R001 for the examination and testing of snubbers. Authorization was granted in an SE by the NRC staff dated January 31, 2007 (ADAMS Accession No. ML070090357). The request was approved through the end of the fourth 10-year ISI interval which is currently scheduled to

end around October 31, 2016. The licensee stated in the submittal that the end of the interval would be February 21, 2014, the expiration date of the original operating license. On December 16, 2010, the operating license for the DAEC was renewed, and the license expiration date was extended to February 21, 2034.

By letters dated August 31, 2011 (ADAMS Accession No. ML11245A240) and December 12, 2012 (ADAMS Accession No. ML12356A185), the licensee submitted the same RR NDE-R001. and stated that the only change to the request from the previous approval was the end date of the fourth 10-year ISI interval from February 21, 2014, to October 31, 2016.

The NRC staff has reviewed the current request RR NDE-R001, and has determined that the technical justification and the conclusion reached by the NRC staff in the January 31, 2007, SE have not changed, based on the new end date of the fourth 10-year ISI interval, which is currently scheduled to end around October 31, 2016.

3.2 RR NDE-R002

By letter dated June 30, 2006 (ADAMS Accession No. ML ML061870230), as supplemented by two letters dated December 21, 2006 (ADAMS Accession Nos. ML070030516 and 070110363, respectively), the licensee requested an essentially identical RR NDE-R002 covering the same inspections of the same components as in the August 31, 2011 submittal. The NRC authorized RR NDE-002 for the 4th 10-year ISI interval through February 21, 2014, the expiration date of the original operating license in an SE dated January 31, 2007 (ADAMS Accession No. ML070090357).

On December 16, 2010, the operating license for the DAEC was renewed, and the license expiration date was extended to February 21, 2034. The fourth 10-year interval is now scheduled to end on October 31, 2016.

In the August 31, 2011, submittal, the licensee stated that the only change to RR NDE-R002 from the previous NRC approval was the change in the duration, from February 21, 2014, to October 31, 2016.

Components for Which Relief is Requested for RR NDE-R002

The licensee stated that Relief Request NDE-R002 is applicable to Class 1, pressure retaining, overlaid welds in piping, under the Examination Categories of B-F and B-J, and the Item Nos of B5.10, B5.20, B5.30, B9.11, B9.21, or B9.31. These welds are subject to nondestructive examinations in accordance with ASME Code, Section XI, 2001 Edition, Appendix VIII, Supplement 11, "Qualification Requirements for Full Structural Overlaid Wrought Austenitic Piping Welds."

ASME Code Requirements for RR NDE-R002 (as stated)

The fourth interval examinations will be performed per the requirements of ASME Code, Section XI, 2001 Edition through the 2003 Addenda, as amended by 10 CFR 50.55a.

Per 10 CFR 50.55a(b)(2)(xxiv), the use of Appendix VIII and supplements to Appendix VIII of Section XI of the 2002 Addenda through the 2003 Addenda is prohibited. Therefore, for Appendix VIII and supplements to Appendix VIII, the 2001 Edition of Section XI (no addenda) will be used.

The following paragraphs are examples of the code requirements for which relief is requested, all of which are contained within Appendix VIII, Supplement 11.

Paragraph 1 .1 (d)(1) requires that all base metal flaws be cracks.

Paragraph 1.1(e)(1) requires that at least 20 percent but less than 40 percent of the flaws shall be oriented within +20 degrees of the pipe axial direction.

Paragraph 1 .1(e)(1) also requires that the rules of IWA-3300 shall be used to determine whether closely spaced flaws should be treated as single or multiple flaws.

Paragraph 1.1(e)(2)(a)(1) requires that a base grading unit shall include at least three inches of the length of the overlaid weld.

Paragraph 1.1(e)(2)(b)(1) requires that an overlay grading unit shall include the overlay material and the base metal-to-overlay interface of at least six-square-inches. The overlay grading unit shall be rectangular with minimum dimensions of two inches.

Paragraph 3.2(b) requires that all extensions of base metal cracking into the overlay material by at least 0.1 inches be reported as being intrusions into the overlay material.

Licensee's Proposed Alternative for RR NDE-R002

Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposed using the Performance Demonstration Initiative (PDI) program in lieu of the requirements of ASME Section XI, 2001 Edition, Appendix VIII, Supplement 11.

Licensee's Basis for the Alternative for RR NDE-R002 (as stated)

Paragraph 1.1(d)(1) requires that all base metal flaws be cracks. 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.

To resolve this issue, the PDI program revised this paragraph to allow use of alternative flaw mechanisms under controlled conditions. For example, alternative flaws shall be limited to when implantation of cracks precludes obtaining an effective ultrasonic (UT) response, flaws shall be semi-elliptical with a tip width of less than or equal to 0.002 inches, and at least 70 percent of the flaws in the detection and sizing test shall be cracks and the remainder shall be alternative flaws.

Relief is requested to allow closer spacing of flaws provided the flaws do not interfere with detection or discrimination. The existing specimens used to date for qualification to the Tri-party (NRC, Boiling Water Reactor Owners Group (BWROG) and Electrical Power Research Institute (EPRI)) agreement have a flaw population density greater than allowed by the current ASME Code requirements. These samples have been used successfully for all previous qualifications under the Tri-party agreement program. To facilitate their use and provide continuity from the Tri-party agreement program to Supplement 11, the PDI program has merged the Tri-party test specimens into their weld overlay program.

For example, the requirement for using IWA-3300 for proximity flaw evaluation in paragraph 1.1(e)(1) was excluded. Instead, indications will be sized based on their individual merits.

Paragraph 1.1(d)(1) includes the statement that intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the base metal flaws.

Paragraph 1.1(e)(2)(a)(1) was modified to require that a base metal grading unit include at least one inch of the length of the overlaid weld, rather than three inches.

Paragraph 1.1(e)(2)(a)(3) was modified to require sufficient unflawed overlaid weld and base metal to exist on all sides of the grading unit to preclude interfering reflections from adjacent flaws, rather than the one inch requirement of Supplement 11.

Paragraph 1.1(e)(2)(b)(1) was modified to define an overlay fabrication grading unit as including the overlay material and the base metal-to-overlay interface for a length of at least one inch, rather than the six-square-inch requirement of Supplement 11.

Paragraph 1.1 (e)(2)(b)(2) states that overlay fabrication grading units designed to be unflawed shall be separated by unflawed overlay material and unflawed base metal-to-overlay interface for at least one inch at both ends, rather than around its entire perimeter.

Additionally, the requirement for axially oriented overlay fabrication flaws in paragraph 1.1 (e)(1) was excluded from the PDI program as an improbable scenario. Weld overlays are typically applied using automated gas tungsten arc welding techniques with the filler metal being applied in a circumferential direction. Because resultant fabrication induced discontinuities would also be expected to have major dimensions oriented in the circumferential direction, axial overlay fabrication flaws are unrealistic.

The requirement in Paragraph 3.2(b) for reporting all extensions of cracking into the overlay is omitted from the PDI program because it is redundant to the root-mean-square (RMS) calculations performed in Paragraph 3.2(c) and its presence adds confusion and ambiguity to depth sizing as required by paragraph 3.2(c). This also makes the weld overlay program consistent with the Supplement 2 depth sizing criteria.

There are, however, some additional changes that were inadvertently omitted from Code Case N-653. In Paragraph 1.1(e)(2)(a)(1) the phrase "and base metal on both sides" was inadvertently included in the description of a base metal grading unit. The PDI program

intentionally excludes this requirement because some of the qualification samples include flaws on both sides of the weld. To avoid confusion, several instances of the term "cracks" or "cracking" were changed to the term "flaws" because of the use of alternative flaw mechanisms.

Additionally, to avoid confusion, the overlay thickness tolerance contained in Paragraph 1.1(b) last sentence, was reworded and the phrase *"and the remainder shall be altemative flaws"* was added to the next to the last sentence in paragraph 1.1(d)(1). Additional editorial changes were made to the PDI program to address an earlier request for additional information.

Duration of Proposed Alternative for RR NDE-R002

The licensee requested approval of the proposed alternative for the fourth 10-year interval of the ISI program for the DAEC.

NRC Staff Evaluation for RR NDE-R002

The United States nuclear utilities created the PDI to implement performance demonstration requirements contained in Appendix VIII of Section XI of the ASME Code. To this end, PDI has developed a program for qualifying equipment, procedures, and personnel for examinations of weld overlays in accordance with the UT criteria of Appendix VIII, Supplement 11. Prior to the Supplement 11 program, EPRI was maintaining a performance demonstration program for weld overlay qualification under the Tri-Party Agreement between the NRC, EPRI, and the BWROG, "Coordination Plan for NRC/EPRI/BWROG Training and Qualification Activities of NDE (Nondestructive Examination) Personnel," dated July 3, 1984. Instead of having two programs with similar objectives, the NRC staff recognized the PDI program for weld overlay qualifications as an acceptable alternative to the Tri-Party Agreement in a letter from William H. Bateman (NRC) to Michael Bratton (PDI Chairman), "Weld Overlay Performance Demonstration Administered by PDI as an Alternative to Generic Letter [GL] 88-01 Recommendations," dated January 15, 2002 (ADAMS Accession No. ML020160532).

The NRC staff routinely assesses the PDI program for consistency with current ASME Code and proposed Code changes. At present, the PDI program does not fully comport with the existing requirements of Supplement 11. PDI presented the differences at public meetings in which the NRC participated as discussed in two Memoranda from Donald G. Naujock (NRC) to Terence L. Chan (NRC), "Summary of Public Meeting Held June 12 through June 14, 2001, with PDI Representatives," dated November 29, 2001 (ADAMS Accession No. ML013330156), and "Summary of Public Meeting Held January 31- February 2, 2001, with PDI Representatives," dated March 22, 2001 (ADAMS Accession No. ML010920009). The differences relate to flaw location within test specimens and fabricated flaw tolerances. The changes in flaw location, permitted using test specimens from the Tri-Party agreement, and the changes in fabrication flaw tolerances provide UT acoustic responses similar to the responses associated with intergranular stress corrosion cracking. Based on the discussions at these public meetings and the review presented in a Pacific Northwest National Laboratory technical letter report submitted in support of the NRC staff's analysis of Carolina Power and Light Company's request for relief (RR-31), the NRC staff determined that the PDI program provides an acceptable level of quality and safety.

Evaluations of the differences identified in the PDI program with Supplement 11, Paragraphs 1.1(b), 1.1(d)(1), 1.1(e)(1), 1.1(e)(2), 1.1(e)(2)(a)(1), 1.1(e)(2)(a)(2), 1.1(e)(2)(a)(3), 1.1(3)(2)(b)(1), 1.1(e)(2)(b)(2), 1.1(e)(2)(b)(3), 1.1(f)(1), 1.1(f)(3), 1.1(f)(4), 2.0, 2.1, 2.2(d), 2.3, 3.1, 3.2(b), and 3.2(c), are as discussed below.

Paragraph 1.1(b) of Supplement 11 states limitations to the maximum thickness for which a procedure may be qualified. The Code states that "The specimen set must include at least one specimen with overlay thickness within minus 0.10-inch to plus 0.25-inch of the maximum nominal overlay thickness for which the procedure is applicable." The Code requirement addresses the specimen thickness tolerance for a single-specimen set, but is confusing when multiple specimen sets are used. The PDI proposed alternative states that "the specimen set shall include specimens with overlay not thicker than 0.10-inch more than the minimum thickness, nor thinner than 0.25-inch of the maximum nominal overlay thickness for which the examination procedure is applicable." The proposed alternative provides clarification on the application of the tolerance. The tolerance is unchanged for a single-specimen set; however, it clarifies the tolerance for multiple specimen sets by providing tolerances for both the minimum and maximum thicknesses. The proposed wording eliminates confusion while maintaining the intent of the overlay thickness tolerance. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraph 1.1(d)(1) of Supplement 11 requires that all base metal flaws be cracks. PDI determined that certain Supplement 11 requirements pertaining to location and size of cracks would be extremely difficult to achieve. For example, flaw implantation requires excavating a volume of base material to allow a pre-cracked coupon to be welded into this area. This process would add weld material to an area of the specimens that typically consists of only base material, and could potentially make UR examination more difficult and not representative of actual field conditions. In an effort to satisfy the requirements, PDI developed a process for fabricating flaws that exhibit crack-like reflective characteristics. Instead of all flaws being racks as required by Paragraph 1.1(d)(1), the PDI weld overlay performance demonstrations contain at least 70 percent cracks, with the remainder being fabricated flaws exhibiting crack-like reflective characteristics. The fabricated flaws are semi-elliptical with tip widths of less than 0.002-inches. The licensee provided further information describing a revision to the PDI program alternative to clarify when real cracks, as opposed to fabricated flaws, will be used; "Flaws shall be limited to the cases where implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws." The NRC has reviewed the flaw fabrication process, compared the reflective characteristics between actual cracks and PDI-fabricated flaws, and found that the fabricated flaws for this application are acceptable. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraph 1.1(e)(1) of Supplement 11 requires that at least 20 percent, but not less than 40 percent, of the flaws be oriented within ±20 degrees of the axial direction (of the piping test specimen). Flaws contained in the original base metal heat-affected zone satisfy this requirement; however, PDI excludes axial fabrication flaws in the weld overlay material. PDI has concluded that axial flaws in the overlay material are improbable because the overlay filler material is applied in the circumferential direction (parallel to the girth weld); therefore, fabrication anomalies would also be expected to have major dimensions in the circumferential direction. The NRC staff finds this approach to implantation of fabrication flaws to be

reasonable; therefore, the NRC staff considers PDI's application of flaws oriented in the axial direction to be acceptable. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraph 1.1(e)(1) of Supplement 11 also requires that the rules of IWA-3300 be used to determine whether closely spaced flaws should be treated as single or multiple flaws. PDI treats each flaw as an individual and not as part of a system of closely spaced flaws. PDI controls the flaws going into a test specimen set such that the flaws are free of interfering reflections from adjacent flaws. In some cases, this permits flaws to be spaced closer than what is allowed for classification as a multiple set of flaws by IWA-3300, thus potentially making the performance demonstration more challenging. Hence, PDI's application for closely spaced flaws is acceptable. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraph 1.1(e)(2) of Supplement 11 requires that specimens be divided into base metal and overlay grading units. The PDI program adds clarification with the addition of the word "fabrication" and ensures flaw identification by ensuring that all flaws will not be masked by other flaws with the addition of "Flaws shall not interfere with ultrasonic detection or characterization of other flaws." The NRC staff finds that PDI's change provides an acceptable clarification regarding flaw identification. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraph 1.1(e)(2)(a)(1) of Supplement 11 requires that a base grading unit include at least three inches of the length of the overlaid weld, and that the base grading unit include the outer 25 percent of the overlaid weld and base metal on both sides. The PDI program reduced the criteria to 1-inch of the length of the overlaid weld and eliminated from the grading unit the need to include both sides of the weld. The proposed change permits the PDI program to continue using test specimens from the existing weld overlay program that have flaws on both sides of the welds. These test specimens have been used successfully for testing the proficiency of personnel for over 16 years. The weld overlay qualification is designed to be a near-side (relative to the weld) examination, and it is improbable that a candidate would detect a flaw on the opposite side of the weld due to the sound attenuation and re-direction caused by the weld microstructure. However, the presence of flaws on both sides of the original weld (outside the PDI grading unit) may actually provide a more challenging examination, as candidates must determine the relevancy of these flaws, if detected. Therefore, the NRC staff concludes that PDI's use of the 1-inch length of the overlaid weld base grading unit and elimination from the grading unit of the need to include both sides of the weld, as described in the revised PDI program alternative, is acceptable. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraph 1.1(e)(2)(a)(2) of Supplement 11 requires that when base metal cracking penetrates into the overlay material, a portion of the base grading unit shall not be used as part of the overlay grading unit. The PDI program adjusts for the changes in Paragraph 1.1(e)(2)(a)(2) and conservatively states that when base metal flaws penetrate into the overlay material, no portion of it shall be used as part of the overlay fabrication grading unit. The PDI program also provided clarification by the addition of the term "flaws" for "cracks" and the addition of "fabrication" to overlay grading unit. The NRC staff finds that the PDI program alternative provides clarification and conservatism. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraph 1.1(e)(2)(a)(3) of Supplement 11 requires that for unflawed base grading units, at least one inch of unflawed overlaid weld and base metal shall exist on either side of the base grading unit. The purpose of this requirement is to minimize the number of false identifications of extraneous reflectors. The PDI program stipulates that unflawed overlaid weld and base metal exists on all sides of the grading unit and flawed grading units must be free of interfering reflections from adjacent flaws, which addresses the same concerns as the ASME Code. Hence, PDI's application of the variable flaw-free area adjacent to the grading unit is acceptable. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraph 1.1(e)(2)(b)(1) of Supplement 11 requires that an overlay grading unit include the overlay material and the base metal-to-overlay interface of at least six square inches. The overlay grading unit shall be rectangular, with minimum dimensions of two inches. The PDI program reduces the base metal-to-overlay interface to at least one inch (in lieu of a minimum of 2 inches) and eliminates the minimum rectangular dimension. This criterion is necessary to allow use of existing examination specimens that were fabricated in order to meet NRC GL 88-01, "NRC Position on IGSCC [intergranular stress-corrosion craking] in BWR [boiling-water reactor] Austenitic Stainless Steel Piping." This criterion may be more challenging than the Code because of the variability associated with the shape of the grading unit. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraph 1.1(e)(2)(b)(2) of Supplement 11 requires that unflawed overlay grading units be surrounded by unflawed material for one inch around its entire perimeter. The PDI program redefines the area by noting that unflawed overlay fabrication grading units shall be separated by at least one inch of unflawed material at both ends and sufficient area on both sides to preclude interfering reflections from adjacent flaws. The relaxation in required area on the sides of the specimens, while still ensuring no interfering reflections, may be more challenging than the Code because of the possibility for having a parallel flaw on the opposite side of the weld. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraph 1.1(e)(2)(b)(3) of Supplement 11 requirements are contained in the PDI program. In addition, the PDI program requires that initial procedure qualification contain three times the number of flaws required for a personal qualification. To qualify new values of essential variables, the equivalent of at least one personal qualification set is required. PDI's additions are more rigorous than the ASME Code requirements. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraph 1.1(f)(1) of Supplement 11 requirements are contained in the PDI program, with the clarifying change of substituting the term "flaws" for "cracks." In addition, the PDI program includes the requirements that sizing sets contain a distribution of flaw dimensions to verify sizing capabilities. The PDI program also requires that initial procedure qualification contain three times the number of flaws required for a personal qualification. To qualify new values of essential variables, the equivalent of at least one personal qualification set is required. PDI's additions are more rigorous than the Code requirements. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraphs 1.1(f)(3) and 1.1(f)(4) of Supplement 11 were clarified by the PDI program by replacing the term "cracking" with "flaws" because of the use of alternative flaw mechanisms. The NRC staff finds this PDI program clarification to be acceptable.

Paragraph 2.0 of Supplement 11 requirements are contained in the PDI program alternative. In addition, the PDI program states for clarification that the overlay fabrication flaw test and the base metal flaw test may be performed separately. The NRC staff finds this PDI program clarification to be acceptable.

Paragraphs 2.1 and 2.2(d) of Supplement 11 were clarified by the PDI program by the addition of the terms "metal" and "fabrication". The NRC staff determined that the clarifications provide acceptable classification of the terms they are enhancing. The NRC staff finds this PDI program clarification to be acceptable.

Paragraph 2.3 of Supplement 11 states that, for depth-sizing tests, 80 percent of the flaws shall be sized at a specific location on the surface of the specimen presented to the candidate. This provision requires detection and sizing tests to be separate. PDI revised the weld overlay program to allow sizing to be conducted either in conjunction with, or separately from, the flaw detection test. If performed in conjunction with detection, and if the detected flaws do not meet the Supplement 11 range criteria, additional specimens will be presented to the candidate with the regions containing flaws identified. Each candidate will be required to determine the maximum depth of flaw in each region. For separate sizing tests, the regions of interest will also be identified, and the maximum depth and length of each flaw in the region will similarly be determined. In addition, PDI stated that grading units are not applicable to sizing tests, and that each sizing region will be large enough to contain the target flaw, but small enough such that candidates will not attempt to size a different flaw. The NRC staff finds that the above clarification provides a basis for implementing sizing tests in a systematic, consistent manner, that meets the intent of Supplement 11. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraphs 3.1 and 3.2 of Supplement 11 state that procedures, equipment, and personnel (as a complete UT system) are qualified for detection or sizing of flaws, as applicable, when certain criteria are met. The PDI program allows procedure qualification to be performed separately from personnel and equipment qualification. Historical data indicate that, if UT detection or sizing procedures are thoroughly tested, personnel and equipment using those procedures have a higher probability of successfully passing a qualification test. In an effort to increase this passing rate, PDI has elected to perform procedure qualifications separately in order to assess and modify essential variables that may affect overall system capabilities. For a procedure to be qualified, the PDI program requires three times as many flaws to be detected (or sized) as shown in Supplement 11 for the entire ultrasonic system. The personnel and equipment are still required to meet Supplement 11; therefore, the PDI program exceeds ASME Code requirements for personnel, procedures and equipment qualification. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraph 3.2(a) of Supplement 11 is clarified by the PDI program by replacing the term "cracking" with "flaws" because of the use of alternative flaw mechanisms. The NRC staff finds this PDI program clarification to be acceptable.

Paragraph 3.2(b) of Supplement 11 requires that all extensions of base metal cracking into the overlay material by at least 0.10 inch be reported as being intrusions into the overlay material. The PDI program omits this criterion because of the difficulty in actually fabricating a flaw with a 0.10-inch minimum extension into the overlay, while still knowing the true state of the flaw dimensions. However, the PDI program requires that cracks be depth-sized to the tolerance specified in the ASME Code, which is 0.125 inches. Since the Code tolerance is close to the 0.10-inch value of Paragraph 3.2(b), any crack extending beyond 0.10-inch into the overlay material would be identified as such from the characterized dimensions. The reporting of an extension in the overlay material is redundant for performance demonstration testing because of the flaw sizing tolerance. Therefore, the NRC staff finds this PDI program revision acceptable.

Paragraph 3.2(c) of Supplement 11 is renumbered to Paragraph 3.2(b) but retained in its entirety. The NRC staff finds this PDI program change to be acceptable.

Based on the above evaluation, the NRC staff has determined that the licensee's proposed alternative to use the PDI program for weld overlay qualifications as described in the submittal, in lieu of Supplement 11 to Appendix VIII of Section XI of the ASME Code, will provide 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 fourth 10-year ISI interval at DAEC.

3.3 RR NDE-R003

By letter dated February 12, 2004, (ADAMS Accession No. ML040550520), the licensee requested an essentially identical RR covering the same inspections of the same component. Relief was granted in a SE by NRC staff dated January 6, 2005 (ADAMS Accession No. ML043270051). The RR was approved through February 21, 2014, the expiration date of the original operating license.

On December 16, 2010, the operating license for the DAEC was renewed and the license expiration date was extended to February 21, 2034. The fourth 10-year interval is now scheduled to end on October 31, 2016.

In the submittal, the licensee stated that the only change to the RRs from the previous approval was the change in the duration, from February 21, 2014, to October 31, 2016.

ASME Code Requirement

The ISI of the ASME Code Class 1, 2, and 3, components is performed in accordance with Section XI of the ASME Code and applicable Addenda as required by 10 CFR 50.55a(g), except where specific relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). Section 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.

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.

ASME Code of Record

The Code of Record for the fourth inspection interval at DAEC is the ASME Section XI 2001 Edition up to the 2003 Addenda. The fourth ISI interval began on November 1, 2006, and is scheduled to end on October 31, 2016.

Licensee's ASME Code RR

The licensee requests relief from the inspection of Reactor Vessel Circumferential (B-A) Welds, Item B1.11, in accordance with 10 CFR 50.55a(a)(3)(i).

The licensee requested relief from the following requirements:

Subarticle IWB-2500, "Examination and Pressure Test Requirements,"
Table IWB 2500-1, Examination Category B-A, Item No. B1.11

Subarticle IWB-2420, "Successive Inspections"
Subarticle IWB-2430, "Additional Examinations"

Licensee's Proposed Alternative to the ASME Code

In accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposes the following alternate provisions for the subject weld examinations:

ISI Scope

The failure frequency for reactor vessel circumferential shell welds is sufficiently low to justify the elimination from the ISI requirement of ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.11. The ISI examination requirements of ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.12, RPV (reactor pressure valve) "Longitudinal Shell Welds," shall be performed, and shall include inspection of the circumferential shell welds only at the intersections of these welds with the longitudinal shell welds, or approximately 2 to 3 percent of the reactor vessel shell circumferential welds. The procedures for these examinations shall be qualified such that flaws relevant to the reactor vessel integrity can be reliably detected and sized, and the personnel implementing these procedures shall be qualified in the use of these procedures.

Successive Examination of Flaws

For ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.11, "Reactor Vessel Shell Circumferential Welds," at intersections with longitudinal shell welds, successive examinations per Subarticle IWB-2420 are not required for non-threatening flaws (original vessel material or fabrication flaws such as inclusions which exhibit negligible or no growth during the life of the vessel), provided that the following conditions are met:

1. The flaw is characterized as subsurface in accordance with BWRVIP-05 (Boiling Water Reactor Vessel and Internals Project), "Boiling Water Reactor (BWR) Reactor Pressure Vessel Shell Weld Inspection Recommendations";

2. The NDE technique and evaluation that detected and characterized the flaw as originating from material manufacture or vessel fabrication is documented in a flaw evaluation report; and,

3. The vessel containing the flaw is acceptable for continued service in accordance with Subarticle IWB-3600, "Analytical Evaluation of Flaws," and the flaw is demonstrated acceptable for the intended service life of the vessel.

For reactor vessel shell longitudinal welds, all flaws shall be re-inspected at successive intervals consistent with ASME Code and regulatory requirements.

Additional Examinations of Flaws

For reactor vessel shell circumferential welds at intersections with longitudinal shell welds, additional requirements per Subarticle IWB-2430 are not required for flaws provided the following conditions are met:

1. If the flaw is characterized as subsurface in accordance with BWRVIP-05, then no additional examinations are required.

2. If the flaw is not characterized as subsurface in accordance with BWRVIP-05, then an engineering evaluation shall be performed, addressing the following as a minimum:

    - a determination of the root cause of the flaw,
    - an evaluation of any potential failure mechanisms,
    - an evaluation of service conditions which could cause subsequent failure, and
    - an evaluation per Subarticle IWB-3600 demonstrating that the vessel is acceptable for continued service.

3. If the flaw meets the criteria of Subarticle IWB-3600 for the intended service life of the vessel, then additional examinations may be limited to those welds subject to the same root cause conditions and failure mechanisms, up to the number of examinations required by IWB-2430(a). If the engineering evaluation determines

that there are no additional welds subject to the same root cause conditions or no failure mechanism exists, then no additional examinations are required.

For reactor vessel shell longitudinal welds, additional examination for flaws shall be in accordance with Subarticle IWB-2430. All flaws in reactor vessel shell longitudinal welds shall require additional weld examinations consistent with ASME Code and regulatory requirements. Examinations of the RPV circumferential shell welds shall be performed if reactor vessel shell longitudinal welds reveal an active, mechanistic mode of degradation.

Licensee's Basis for RR

The BWRVIP-05 provides the technical basis to justify relief from the examination requirements for reactor vessel shell circumferential welds. The results of the NRC's evaluation of BWRVIP-05 are documented in the NRC staff's SE dated July 28, 1998 (ADAMS Accession No. 9808120118). NRC GL 98-05, "BWR Licensees Use of the BWRVIP-05 Report to Request Relief from Augmented Examination Requirements on Reactor Pressure Vessel Circumferential Welds," permits BWR licensees to request permanent (i.e., for the remaining term of operation under the existing, initial, license) relief from the ISI requirements of 10 CFR 50.55a(g) for the volumetric examination of reactor vessel circumferential shell welds. This relief can be granted by demonstrating that the following GL criteria are satisfied:

1. At the expiration of their license, the circumferential shell welds will continue to satisfy the limiting conditional failure probability for circumferential shell welds in the NRC staff's July 28, 1998 SE, and

2. Licensees have implemented operator training and established procedures that limit the frequency of cold overpressure events to the amount specified in the NRC staff's July 28, 1998 SE.

In GL 98-05 it also states that licensees will still need to perform the required inspections of "essentially" 100 percent of all longitudinal shell welds.

Licensee's Response to Criterion 1

The licensee's information regarding effects of irradiation on bounding DAEC reactor vessel shell circumferential weld properties are presented in a table for RR NDE-R003 in Section H of the RR. This table provides a comparison of the limiting reactor vessel shell circumferential shell parameters for DAEC to those found in Table 2.6-4 of the NRC staff's July 28, 1998, SE for a reactor vessel manufactured by the Chicago Bridge and Iron Company (CB&I). The chemistry factor for the DAEC bounding weld is lower than the chemistry factor for the limiting plant specific NRC analysis. The 32 effective full-power year (EFPY) inside diameter fluence for the unit is also lower than the NRC estimated 32 EFPY neutron fluence. As a result, the shift in reference temperature for the DAEC limiting circumferential shell weld is lower than the 32 EFPY shift from the NRC analysis. Although the unirradiated reference temperature is higher than the NRC limit, the overall result for the DAEC limiting circumferential shell weld is a lower calculated mean reference temperature than the NRC mean analysis value. Therefore, the reactor vessel weld embrittlement due to neutron fluence is calculated to be less than the NRC's

limiting case, and the unit's reactor vessel circumferential shell weld failure probability is bounded by the conditional failure probability in the NRC's limiting plant-specific analysis through 32 EFPY.

Licensee's Response to GL 98-05, Criterion 2

The licensee has procedures in place for DAEC that guide operators in controlling and monitoring reactor pressure during all phases of operation, including cold shutdown. Use of these procedures minimizes the potential for low temperature overpressurization (LTOP) events, and is reinforced through operator training. A primary system leakage test is performed prior to each restart after a refueling outage. The DAEC test procedure contains additional requirements to aid in the prevention of an LTOP event, and requires a briefing prior to test commencement with all involved personnel. Reactor vessel temperature and pressure are required to be monitored and controlled to within the technical specifications (TS) pressure and temperature (P-T) limits during the entire test.

The NRC staff's July 28, 1998, SE discussed the risk of cold overpressurization due to control rod drive (CRD) injection if a loss-of-station power occurs during the pressure test. A subsequent restart of the CRD pumps without restoring the reactor water clean (RWCU) pump would cold pressurize the RPV. The licensee implemented two special precautions in DAEC's surveillance test procedure to preclude this from occurring: (1) allow the system to depressurize by opening the cleanup system drain header control valve in the event of a loss of offsite power, and (2) instruct operators to immediately trip the CRD pump if RWCU isolates. During cold shutdown, the CRD and RWCU systems are used to control RPV water level and pressure. The low flow rate of these pumps allows sufficient time for operators to react; therefore, they are unlikely to cause overpressurization during cold shutdown.

Other than the CRD system, the other high-pressure coolant sources that could inadvertently initiate and result in an LTOP event are high-pressure coolant injection (HPCI), reactor core isolation cooling (RCIC), and feedwater/condensate systems. During cold shutdown there is no steam available to drive the turbine driven HPCI or RCIC pumps. Therefore, the HPCI and RCIC systems will not cause a cold overpressure event while DAEC is in the cold shutdown operating mode.

During a normal reactor vessel fill sequence prior to pressure testing, the condensate system is used to fill the reactor. To prevent injection by an inadvertent start of a feedwater pump, injection of feedwater with vessel water level greater than 211 inches is controlled by a high water interlock. This interlock prevents starts of the feedwater pumps when reactor vessel water level is equal to or greater than 211 inches. Defeating this interlock is procedurally and administratively controlled. Further, the likelihood of overpressurization at low temperature during startup is reduced by an administrative action requiring the reactor vessel head vents not be closed until the reactor vessel coolant temperature reaches 212 degrees Fahrenheit (°F). Therefore, the feedwater/condensate system does not present a significant potential for overpressurization.

The standby liquid control (SBLC) system is also a high-pressure water source to the reactor vessel. There are no automatic starts associated with this system. Operation of the SBLC

system requires an operator to manually start the system by a keylock switch. Procedures have been developed for operation of the SBLC system, and operators are trained on the system operation. Therefore, this system does not present a significant potential for overpressurization.

The low-pressure coolant sources include the residual heat removal (RHR), low-pressure coolant injection (LPCI), and the core spray (CS) systems. Based on observation and alarm of reactor vessel water level, operators would detect and terminate an inadvertent injection of LPCI or CS. Further, a cold overpressure event is prevented by plant procedures which require the operator to place the reactor vessel head vent valves in an open position when reactor vessel coolant temperature is below 212 °F during cold shutdown with vessel head in tension. During refueling outages, a CS pump may be used for reactor vessel and cavity fill; however, overpressurization is prevented by having the reactor vessel head removed under these conditions. When the condensate, CS, or RHR system is activated in the event of a loss of shutdown cooling, the safety relief valve is opened in accordance with abnormal operating procedure to prevent an overpressure event. In addition to the procedural barriers, licensed operators are provided specific training regarding the methods of controlling reactor vessel water level and the TS requirements on P-T limits. Simulator sessions are conducted which include plant heat-up and cool-down.

NRC Staff Evaluation

This RR is essentially an extension of the relief granted on January 6, 2005, until the end of the now-extended fourth ISI interval. It is worth noting that no relevant issues have emerged since the previous SE that would affect the relief granted on January 6, 2005. The NRC staff has reviewed the licensee's submittal and finds that relevant information is identical to the information provided by letter dated February 12, 2004. NRC staff reviewed the previous submittal and NRC staff SE, and confirmed that the licensee has demonstrated that the appropriate criteria in GL 98-05 and the NRC staff's July 28, 1998 SE have been satisfied regarding permanent relief (i.e., for the remaining portion of the original license period of 32 EFPY and the end of the extended fourth 10-year ISI interval of October 31, 2016) from ISI requirements of ASME Code, Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.11, for the volumetric examination of reactor vessel shell circumferential welds. Hence, the NRC staff concludes that the licensee's RR, pursuant to 10 CFR 50.55a(a)(3)(i), is acceptable and is consistent with the information contained in NRC GL 98-05. The NRC staff has also determined that the proposed alternative provides an acceptable level of quality and safety through the end of the fourth 10-year ISI interval, on October 31, 2016.

3.4 RR NDE-R004

In its SE for RR NDE-R004 dated June 12, 2007 (ADAMS Accession number M071380183), the NRC staff concludes that the licensee's proposed alternative to use ASME Code Case N-700 for welded attachments on vessels provides an acceptable level of quality and safety. Therefore, the licensee's alterative is authorized pursuant to 10 CFR 55.55a(a)(3)(i) for the licensee's fourth 10-year ISI interval or until ASME Code Case N-700 is approved for general use by reference in Regulatory Guide (RG) 1.147 *Inservice Inspection Code Case Acceptability*, ASME Section XI, Division 1, whichever event occurs first. If and when ASME Code Case

N-700 is so approved, the licensee must follow the conditions, if any are specified in RG 1.147, to continue the use of Code Case N-700.

However, the NRC has accepted Code Case N-700 in RG 1.147, Revision 16. Therefore, RR NDE-R004 is no longer needed.

3.5 RR NDE-R005

By letter dated June 30, 2006 (ADAMS Accession No. ML ML061870230), as supplemented by two letters dated December 21, 2006 (ADAMS Accession Nos. ML070030516 and ML070110363, respectively), the licensee requested an essentially identical RR NDE-R005 covering the same inspections and components as in the August 31, 2011, submittal. The NRC authorized Relief Request NDE-R005 for the fourth 10-year ISI interval through February 21, 2014, the expiration date of the original operating license in a SE dated January 31, 2007 (ADAMS Accession No. ML070090357).

On December 16, 2010, the operating license for the DAEC was renewed, and the license expiration date was extended to February 21, 2034. The fourth 10-year interval is now scheduled to end on October 31, 2016.

In the August 31, 2011, submittal, the licensee stated that the only change to RR NDE-R005 from the previous NRC approval was the change in the duration, from February 21, 2014, to October 31, 2016.

Components for Which Relief is Requested for NDE-R005

The licensee stated that RR NDE-R005 is applicable to ASME Code Class 1 and 2 welds. The Examination Categories are B-F and B-J, for Class 1 welds, and C-F-2 for Class 2 welds. The Item numbers are B5.10, B5.20, B5.30, B9.11, B9.21, B9.32, B9.40, C5.51, and C5.81.

ASME Code Requirements for RR NDE-R005 (as stated)

ASME Code Section XI 2001 Edition with 2003 Addenda, IWB-2500-1 requires in part that for each successive 10-year ISI interval, 100 percent of Category B-F welds for the ASME Code Class 1 piping 4-inch nominal pipe size (NPS) and greater be selected for volumetric and surface examination.

IWB-2500-1 requires, in part, that for each successive 10-year interval, 100 percent of Category B-F welds for the ASME Class 1 piping less than 4-inch NPS be selected for surface examination.

IWB-2500-1 requires, in part, that for each successive 10-year interval, 100 percent of Category B-F socket welds for the ASME Class 1 piping be selected for surface examination.

IWB-2500-1 requires, in part, that for each successive 10-year ISI interval, 25 percent of Category B-J welds for the ASME Class 1, piping, 4-inch NPS and greater be selected for volumetric and surface examination.

IWB-2500-1 requires in part that for each successive 10-Year Interval, 25 percent of Category B-J welds for the ASME Class 1 piping, less than 4-inch NPS be selected for surface examination.

IWB-2500-1 requires, in part, that for each successive 10-year interval, 25 percent of Category B-J socket welds for the ASME Class 1, piping be selected for surface examination.

IWC-2500-1 requires, in part, that for each successive 10-year interval, 7.5 percent of C-F-2 welds be examined for ASME Code Class 2 piping greater than 4-inch NPS and 3/8-inch or greater nominal wall thickness for volumetric and surface examination.

IWC-2500-1 requires in part that for each successive 10-Year Interval, 7.5 percent of C-F-2 welds be examined for ASME Class 2 piping 2-inch NPS or less for surface examination.

Reason For RR NDE-R005 (as stated)

ASME Code, Section XI, Examination Categories B-F and B-J, currently contain the requirements for NDE of Class 1 piping components. Section XI, Examination Category C-F-2, currently contains the requirements for the NDE of Class 2 piping components. The previously NRC-approved risk informed inservice inspection (RI-ISI) program dated January 17, 2003 (ADAMS Accession No. ML023530046), will be substituted for Class 1 and Class 2 piping (Examination Categories B-F, B-J, and C-F-2) in accordance with 10 CFR 50.55a(a)(3)(i) by alternatively providing an acceptable level of quality and safety. Other non-related portions of the ASME Section XI Code will be unaffected. For example, existing pressure testing requirements remain unchanged.

Licensee's Proposed Alternative and Basis for RR NDE-R005

Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee requested NRC approval of the DAEC RI-ISI as an alternative to the current 2001 Edition through 2003 Addenda, ASME Section XI inspection requirements for Class 1 and Class 2 Code Examination Category B-F, B-J, and C-F-2 piping welds. This request is to extend the relief previously granted to include the Fourth 10-year ISI interval.

The licensee initially submitted the DAEC RI-ISI program to the NRC for the third 10-year ISI interval in a letter dated March 29, 2002 (ADAMS Accession No. ML020990346), and supplemented in a letter dated September 6, 2002 (ADAMS Accession No. ML022610353). The NRC approved the DAEC RI-ISI program for use in the third 10-year ISI interval in a letter dated January 17, 2003 (ADAMS Accession No. ML023530046). The licensee proposes to extend the same RI-ISI program from the third 10-year ISI interval to the fourth 10-year ISI interval.

The licensee developed its DAEC RI-ISI program in accordance with the EPRI methodology contained in EPRI Topical Report (TR)-1 12657, Revision B-A, "Risk-Informed Inservice Inspection Evaluation Procedure," December 1999. The NRC approved the RI-ISI program for use at DAEC during the second and third periods of the third 10-year ISI interval. The licensee requested the RI-ISI program to be applicable for the fourth ISI interval. Table 1 of RR NDE-

R005 in the August 31, 2011, submittal reflects the recommended approach as provided in the Nuclear Energy Institute (NEI) 04-05 "Living Program Guidance To Maintain Risk-Informed Inservice Inspection Programs For Nuclear Piping Systems," April 2004, for requesting relief to continue the RI-ISI program into the next inspection interval. Table 1 shows that the final consequence ranking has not changed for individual line segments. Therefore, the change in risk assessment for the new inspection interval as compared to the original RI-ISI submittal meets the acceptance criteria of the original RI-ISI submittal.

The licensee updated the RI-ISI program after a rigorous review of inputs and technical elements of the original submittal consistent with the intent of NEI-04-05 and continues to meet EPRI TR-112657 and RG 1.174 risk acceptance criteria. The current Class 1 and 2 piping weld scope is consistent with the submitted scope approved for the third ISI interval program. The original list DAEC intended to credit for Class 1 or 2 RI-ISI piping weld examinations has been substituted on specific occasions with similar welds due to accessibility issues that would have resulted in reduced examination volumes. DAEC chooses welds for examination that are classified within the same risk matrix classification segment, using the same treatment criteria as those originally selected in the first submittal. Socket welds that are chosen by the RI-ISI program for examination will be subjected to VT-2 examinations as described by ASME Code Case N-578-1. Welds chosen based on risk consequence alone will be volumetrically examined per the ASME Code, Section XI, the 2001 Edition through the 2003 Addenda requirements for B-F, B-J, or C-F-2, welds depending on weld type.

The licensee stated that the third interval RI-ISI program required DAEC to complete 38.7 percent of the Section XI examinations in the first period and the remaining 61.3 percent of the RI-ISI program welds were to be completed by the end of the third ISI interval. This RR is to align the RI-ISI interval and ASME Code with the fourth ISI interval program. Therefore, 100 percent of the RI-ISI program weld examinations will be completed in the fourth ISI interval.

The licensee further stated that all probabilistic risk analysis (PRA) inputs reported in the RI-ISI relief are derived from the Revision 5B PRA model, which was completed in February of 2005. The base core damage frequency value from this model, excluding internal flooding initiated sequences, is 1.10E-05 per year. This same Revision 5B PRA model was used as input to the Mitigating Systems Performance Index (MSPI).

The licensee explained that because of its on-going use as a decision-making tool, the DAEC PRA has been through a peer review as part of the BWROG PRA certification program. The peer review team concluded that all of the graded elements are of sufficient detail and quality to support a risk significance determination supported by deterministic insights. The review team also commented on the DAEC's excellent PRA documentation and very consistent level of quality across all elements of the certification. Key PRA parameters, including train and component PRA importance parameters calculated for the MSPI, have been subjected to a cross comparison study performed by the Integrated Risk Informed Regulation (IRIR) Committee of the BWRG (Reference: NEDO-33215, GE Nuclear Energy, "BWR Owners' Group MSPI Cross Comparison Preliminary Results," September 2005.)

According to the licensee, none of the DAEC systems scoped for MSPI are identified as candidate outliers. This provides a reasonable level of confidence that the DAEC PRA model is

adequate for use in the MSPI application. Since there is an overlap between systems evaluated in the RI-ISI application and those monitored in the MSPI program, the PRA cross comparison effort, although performed specifically for the MSPI application, provides confidence that the PRA model is of sufficient quality that it may be used for the RI-ISI application. The licensee stated that the final step in the cross-comparison process for the MSPI application was a high level screening of PRA metrics. Values reported for the DAEC in this step were consistent with calculated MSPI parameters reported for comparison purposes in previous steps, again indicating the accuracy of the PRA model for other applications and in particular for use on the Risk-ISI application.

Duration of Proposed Alternative for RR NDE-R005

The licensee requested the proposed alternative to be applicable to extension into the fourth 10-year ISI interval of the DAEC ISI program.

NRC Staff Evaluation for RR NDE-R005

The licensee requested relief for continued use of the approved RI-ISI program plan in the fourth 10-year ISI interval instead of the ASME Code Section XI program. An acceptable RI-ISI program plan is expected to meet the five key principles of risk-informed decision making, discussed in (1) RG 1.178, "An Approach for Plant-Specific Risk-Informed Decision Making: Inservice Inspection of Piping", (2) Standard Review Plan 3.9.8, NUREG-0800, Chapter 19, and (3) EPRI TR-112657, Revision B-A, as stated below.

1. The proposed change meets the current regulations unless it is explicitly related to a requested exemption or rule change.

2. The proposed change is consistent with the defense-in-depth philosophy.

3. The proposed change maintains sufficient safety margins.

4. When proposed changes result in an increase in core damage frequency (CDF) and/or large early release frequency (LERF), the increases should be small and consistent with the intent of the Commission's Safety Goal Policy Statement.

5. The impact of the proposed change should be monitored by using performance measurement strategies.

The first principle is met in this RR because an alternative ISI program may be authorized pursuant to 10 CFR 50.55a(3)(i) and, therefore, an exemption request is not required.

The second and third principles require assurance that the alternative program is consistent with the defense-in-depth philosophy and that sufficient safety margins are maintained, respectively. The methodology used to develop the fourth 10-year RI-ISI program interval is unchanged from the methodology approved for use in the third 10-year RI-ISI interval program at DAEC. Assurance that the second and third principles are met is based on the application of the

approved methodology and not on the particular inspection locations selected. Therefore, the NRC staff finds that the second and third principles are met.

The fourth principle requires an estimate of the change in risk, and the change in risk is dependent on the number and location of inspections in the proposed ISI program compared to the number and location of inspections that would be inspected using the requirements of ASME Section XI. Pursuant to EPRI TR-112657, Revision B-A, a change in risk measurement should consider the discontinuance of ASME Code required inspections, as well as any new inspections resulting from the application of its methodology. The PRA inputs reported in the DAEC fourth interval RI-ISI relief to calculate the change in risk are derived from the DAEC Revision 5B PRA model. The baseline CDF from this model excluding internal flooding initiated sequences was calculated to be 1.10E-5 per year. The baseline LERF was calculated to be 1.23E-6 per year.

The licensee states that the DAEC PRA has been through a peer review as part of the BWROG PRA certification program. The peer review team concluded that all of the graded elements are of sufficient detail and quality to support a risk significance determination. As further clarified in the submittal, all major issues and observations from the BWROG certification (i.e., Level A and B facts and observations) associated with the LERF calculation have been addressed and incorporated into the Revision 5 PRA model. The licensee indicates that the DAEC RI-ISI program has been developed in accordance with the EPRI methodology contained in EPRI TR-112657, Revision B-A, and continues to meet RG 1.174 risk acceptance criteria.

The licensee has re-evaluated the risk assessment by updating and revising the consequence ranking. Table 1 of RR NDE-R005 in the August 31, 2011, submittal, shows that the consequence ranking of one reactor core isolation cooling pipe segment and one HPCI pipe segment was increased from low to medium as an effect from the updated probabilistic safety assessment model. Although the risk category associated with these pipe segments increased from Category 7 to Category 6, the change did not affect the examination selections because neither Category 7 nor Category 6 pipe segments need to be inspected. The risk impact analysis performed in support of the original DAEC RI-ISI submittal was conducted using the upper bound values of conditional core damage probability and conditional large early release probability, and the upper bound conditional probabilities are the same for Category 6 and Category 7. Since the risk ranking of line segments has not changed and the number of examinations has not decreased as a result of this RR, the NRC staff agrees that the results and conclusions of the original cumulative risk impact analysis are unaffected.

Given the above considerations concerning the increase in risk and DAEC PRA quality, the NRC staff finds that the licensee's analysis provides assurance that the fourth key principle is met. Therefore, the continued use of the RI-ISI program will not cause the NRC safety goals to be exceeded.

With regard to the fifth principle of risk-informed decision making, RR NDE-R005 states that the DAEC RI-ISI program was developed in accordance with the EPRI methodology contained in EPRI TR-112657, Revision B-A. This program has been updated after a rigorous review of inputs and technical elements of the original submittal consistent with the intent of NEI 04-05, "Living Program Guidance to Maintain Risk-Informed Inservice Inspection Programs for Nuclear

Plant Piping Systems," and thus continues to be a living program and meets the risk acceptance criteria of RG 1.174 "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis." Therefore, the NRC staff finds that the fifth key principle is also met.

Based on the above discussion, the NRC staff finds that the five key principles of risk-informed decision-making are met by the licensee's RI-ISI program for the fourth 10-year ISI interval. The NRC staff finds that the proposed RI-ISI program will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff authorizes use of the proposed RI-ISI program for Class 1 and Class 2 ASME Code, Examination Category B-F, B-J, and C-F-2, piping welds for the remainder of the fourth 10-year ISI interval at DAEC.

3.6 RR NDE-R006

By letter dated June 30, 2006 (ADAMS Accession No. ML ML061870230), as supplemented by two letters dated December 21, 2006 (ADAMS Accession Nos. ML070030516 and ML070110363, respectively), the licensee requested an essentially identical RR NDE-R006 covering the same inspections of the same components as in the August 31, 2011, submittal. The NRC authorized RR NDE-R006 for the fourth 10-year ISI interval through February 21, 2014, the expiration date of the original operating license in an SE dated January 31, 2007 (ADAMS Accession No. ML070090357).

On December 16, 2010, the operating license for the DAEC was renewed, and the license expiration date was extended to February 21, 2034. The fourth 10-year interval is now scheduled to end on October 31, 2016.

In the August 31, 2011, submittal, the licensee stated that the only change to RR NDE-R006 from the previous NRC approval was the change in the duration, from February 21, 2014, to October 31, 2016.

Components for Which Relief is Requested For NDE-R006

The licensee stated that the request is applicable to various components in ASME Code Classes 1, 2, and 3. The Examination Categories are B-G-1, B-G-2, B-L-2, B-M-2, B-N-1, B-N-2, B-P, C-B, C-H, D-A, D-B, and F-A. The Item numbers are B6.10, B6.50, B6.190, B6.200, B7.10, B7.50, B7.60, B7.70, B7.80, B12.20, B12.50, B13.10, B13.20, B13.30, B13.40, B15.10, C7.10, D1.20, D2.10, F1.10, F1.20, F1.30, and F1.40.

ASME Code Requirements for RR NDE-R006 (as stated)

ASME Code Section XI, 2001 Edition through the 2003 Addenda, paragraphs IWA-2210 through IWA-2213 and Table IWA-2210-1.
IWA-2210, "Visual examinations," requires that visual examinations be conducted in accordance with Section V, Article 9, Table IWA-2210-1, and the following:

(a) A written procedure and report of examination results is required.

(b) For procedure demonstration, a test chart containing text with some lower case characters without an ascender or descender (e.g., a, c, e, o) meeting Table IWA-2210-1 is required. Measurements of the test chart shall be made once before initial use with an optical comparator (10X or greater) or other suitable instrument to verify that the height of a representative lower case character without an ascender or descender, for the selected type size meets the requirements of Table IWA-2210-1.

(c) Remote examination may be substituted for direct examination. The remote examination procedure shall be demonstrated to resolve the selected test chart characters.

(d) Alternatives to direct visual examination distance requirements of Section V may be used as specified in Table IWA-2210-1.

(e) It is not necessary to measure illumination levels on each examination surface when the same portable light source or similar installed lighting equipment is demonstrated to provide the illumination specified in Table IWA-2210-1 at the maximum examination distance.

(f) The adequacy of the illumination levels from battery powered portable lights shall be checked before and after each examination or series of examinations, not to exceed 4 hours between checks. In lieu of using a light meter, these checks may be made by verifying that the illumination is adequate (i.e., no discernable degradation in the visual examination resolution of the procedure demonstration test chart characters).

IWA-2211, "VT-1 Examinations," requires that VT-1 examinations be conducted to detect discontinuities and imperfections on the surface of components, including such conditions as cracks, wear, corrosion, or erosion.

IWA-2212, "VT-2 Examinations," requires that: (a) VT-2 examinations be conducted to detect evidence of leakage from pressure retaining components, with or without leakage collection systems, as required during the conduct of system pressure test; and (b) VT-2 examinations shall be conducted in accordance with IWA-5000. For direct examination, the Table IWA-2210-1 maximum examination distance shall apply to the distance from the eye to the surfaces being examined.

IWA-2213, "VT-3 Examination," requires that VT-3 examinations be conducted to determine the general mechanical and structural condition of components and their supports by verifying parameters such as clearances, settings, and physical displacements; and to detect discontinuities and imperfections, such as loss of integrity at bolted or welded connections, loose or missing parts, debris, corrosion, wear, or erosion. VT-3 includes examinations for conditions that could affect operability or functional adequacy of snubbers and constant load and spring-type supports.

Table IWA-2210-1

Visual Examination	Minimum Illumination, Foot-candles (Note 1)	Maximum Direct Examination Distance, ft (mm)	Maximum Procedure Demonstration Lower Case Character Height, in. (mm)
VT-1	50	2 (609.6)	0.044(1.1)
VT-2	15	6 (1829)	0.158(4)
VT-3	50	4 (1219)	0.105 (2.7)

Notes:

1. Resolution of the specified characters can be used in lieu of illumination measurement to verify illumination adequacy.

Reason for RR NDE-R006 (as stated)

Pursuant to 10 CFR 50.55a(a)(3)(ii), the licensee requests authorization to use ASME Code Case N-686, "Alternate Requirements for Visual Examinations, VT-1, VT-2, and VT-3, Section XI, Division 1," approved by ASME on February 14, 2003, in lieu of the requirements of ASME Code Section XI, IWA-2210 through IWA-2213 and Table IWA-2210-1, when performing VT-1, VT-2, and VT-3, visual examinations.

In order to meet the distance requirements to gain access to all areas to complete VT-2 and VT-3, visual examinations in accordance with IWA-2210 through IWA-2213, and Table IWA-2210-1, remote visual equipment would have to be used or scaffolding would have to be erected and removed for some locations. This effort would cause additional radiation exposure. This requirement will cause a hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Licensee's Proposed Alternative for RR NDE-R006 (as stated)

As the proposed alternative, DAEC will use the provisions in Code Case N-686, without exception, in lieu of IWA-2210 through IWA-2213, and Table IWA-2210-1, when performing VT-1, VT-2, and VT-3, visual examinations. Specifically, Code Case N-686 states that VT-2 examination shall be conducted in accordance with IWA-5000, and that for VT-3 examination, there are no direct VT examination distance requirements, provided the examiner can resolve the characters in accordance with Table 1 (shown below). The only difference in the VT-1 examination is that the metric system for distance has been rounded off (slightly different numbers) in Code Case N-686.

Code Case N-686, Table 1

Visual Examination	Minimum Illumination, footcandles (Note 1)	Maximum Direct Examination Distance, ft (mm)	Maximum Height, in. (mm) for Procedure Demonstration Characters (Note 2)
VT-1	50	2(600)	0.044 (1.0)
VT-3	50	N/A	0.105 (3.0)

Notes:

1. Resolution of the specified characters can be used in lieu of illumination measurement to verify illumination adequacy.

2. For procedure demonstration, a test chart or card containing text with some lower case characters, without an ascender of descender (e.g., a, c, e, o), that meet the specified height requirements is required. Measurement of the test chart or card shall be made once before its initial use with an optical comparator (10X or greater) or other suitable instrument to verify that the height of the lower case characters without an ascender or descender meets the specified requirements.

DAEC will perform VT-2 and VT-3 examinations without direct visual examination distance requirements in accordance with Code Case N-686.

Licensee's Basis for RR NDE-R006 (as stated)

The different visual examination techniques have evolved over the years from a single technique (VT-1) to the separate techniques of VT-1, VT-2, and VT-3, with examination requirements commensurate with their application.

ASME Section XI, 1974 Edition, summer 1975, Addenda, contained only one visual examination:

IWA-2210, "VISUAL EXAMINATION"

(a) A visual examination is employed to provide a report of the general condition of the part, component, or surface to be examined, including such conditions as scratches, wear, cracks, corrosion, or erosion on the surfaces; misalignment or movement of the part or component; or evidence of leaking.

(b) Visual examination shall be conducted in accordance with Article 9 of Section V, except that lighting shall be sufficient to resolve the 1/32-in. line.

The requirements of the corresponding edition of Section V, Article 9, "Visual Examination," are summarily stated as: "Direct visual examination may usually be made when access is sufficient to place the eye within 24 in. of the surface to be examined and at an angle not less than 30 deg. to the surface to be examined. Mirrors may be used to improve the angle of vision.... Remote visual examination may use visual aids.... Such systems shall have a resolution capability at least equivalent to that obtainable by direct visual observation. "

This one visual examination contained requirements for physical damage (e.g., scratches, wear, cracks, corrosion, erosion), physical displacement (e.g., misalignment, movement), and evidence of leaking and applied it to all visual examinations required by Section XI, including pressure retaining welds, pressure retaining bolting, vessel cladding, vessel interior, component supports, and leakage tests.

In the 1970s, the VT examinations were split into multiple examinations. For example, VT-1 for physical damage, with defined prerequisites; VT-2 for pressure boundary leakage, with fewer defined prerequisites; VT-3 for physical displacement, also with fewer defined prerequisites; and VT-4 for functional adequacy. The reason the visual examinations were separated into multiple methods with appropriate requirements was to apply a level of visual examination commensurate with the application.

The visual VT-2 examination performed during the Class 1 system leakage test is typically performed after a refueling outage when the unit is at reactor pressure and temperature. Table IWA-2210-1 requires the examiner to be within six feet of the surfaces being examined or use remote examination equipment that provides demonstrated equivalent resolution. For an examiner to be within six feet of the surfaces being examined would require the erection of scaffolding to perform a system pressure test because the piping runs for certain systems may be 20 to 30 feet above the floor. The plant personnel erecting and taking down the scaffolding or the additional plant personnel required to perform remote examinations (for example, personnel to install or hold a light source if the examiner used binoculars) would receive unnecessary radiation exposure. However, ASME Code Case N-686 allows the examiner to conduct VT-2 examinations to detect evidence of leakage from pressure retaining components without a distance limitation and prescribes examinations in accordance with IWA-5000. Paragraph IWA-5241, "Insulated and Non-insulated Components," allows the examiner to perform examinations for leakage "... *by examining the accessible external exposed surfaces of pressure retaining components... For components whose external surfaces are inaccessible for direct VT-2 visual examination, only the examination of the surrounding area (including floor areas or equipment surfaces located underneath the components) for evidence of leakage shall be required."*

Table IWA-2210-1 also requires a minimum illumination level of 15 foot-candles for a VT-2 examination. In order to meet this illumination level, temporary light may have to be provided which, again, involves more plant personnel and causes additional radiation exposure. Experience has shown, however, that there are other effective techniques and tools for locating leakage. For example, when water is illuminated with a flashlight it has a "mirror effect" or shiny reflective area, allowing leaks to be located from distances greater than six feet. Therefore, a VT-2 examination using a flashlight provides a level of quality equivalent to performing the examination with general illumination of 15 foot-candles.

A VT-3 examination is conducted to determine the general mechanical and structural condition of a component or a component support. Table IWA-221 0-1 requires the examiner to be within four feet of the surfaces being examined or use remote examination equipment that provides demonstrated equivalent resolution. Again, the piping runs for certain systems may be 20 to 30 feet above the floor. This would require the erection of scaffolding to perform a visual examination of a component support. In addition, as discussed above, the use of remote examination equipment involves more plant personnel.

The industry has over 30 years of experience performing visual examinations to the less prescriptive requirements for proximity and illumination, and examiners are fully qualified in accordance with IWA-2300, "Qualifications of Nondestructive Examination Personnel." Experience, training, and qualifications of visual examiners provide reasonable assurance that they will apply the appropriate illumination and distance requirements required to perform quality examinations.

The specific requirements of IWA-2210 through IWA-2213, and Table IWA-2210-1, will cause a hardship or unusual difficulty without a compensating increase in the level of quality and safety due to as low as reasonably achievable (ALARA) considerations. Thirty years of industry experience performing system pressure tests demonstrates that an equivalent level of quality and safety can be achieved by performing VT-2 examinations at distances well in excess of six feet and VT-3 examinations at distances well in excess of four feet. These time-proven methods for conducting visual examinations will continue to provide reasonable assurance of structural integrity while preventing plant personnel from receiving excessive radiation exposure.

The 1989 Edition of ASME Section XI, which was the applicable ASME Code for the DAEC third 10-year interval, did not specify distance and illumination requirements for VT examinations; however, per an Erratum, VT examinations now include distance and illumination requirements. ASME Code Case N-686 was prematurely incorporated into ASME Section XI 2001 Edition, 2003 Addenda (Sections IWA-2210 through 2213, including Table IWA 2211-1). An Erratum was issued in December 2003, which restored it back to the 2002 Addenda version, which specifies distance and illumination requirements. Subsequently, Code Case N-686 was incorporated into the 2004 Edition 2005 Addenda of ASME Section XI. However, the applicable code edition and addenda for DAEC is ASME Code Section XI, 2001 Edition, 2003 Addenda.

Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), DAEC requests authorization to use ASME Code Case N-686 in lieu of ASME Code IWA-2210 through IWA-2213 and Table IWA-2210-1 requirements.

Duration Of Proposed Alternative For RR NDE-R006

The licensee requested the proposed alternative to be used for the entire fourth 10-year interval of the ISI program for DAEC.

NRC Staff Evaluation For RR NDE-R006

The licensee stated that the 1989 Edition of ASME Section XI was the applicable ASME Code of record for DAEC for the third 10-year ISI interval. The 1989 Edition of ASME Section XI did

not specify distance and illumination requirements for visual examinations. Distance and illumination requirements were later added. Code Case N-686 was developed and incorporated into ASME Section XI, 2001 Edition, 2003 Addenda. However, in December 2003, an Erratum was issued that restored the visual examination requirements to the 2002 Addenda version, which specified distance and illumination requirements. Code Case N-686 was again incorporated into the 2004 Edition and the 2005 Addenda of ASME Section XI. The applicable Code edition and addenda for DAEC's fourth 10-year ISI interval is ASME Code, Section XI, 2001 Edition through the 2003 Addenda, which was affected by the Erratum of December 2003.

The licensee stated that in order to meet the distance requirements, and to gain access to areas of complete VT-2 and VT-3 visual examinations, required by the ASME Code of record, paragraphs IWA-2210 through IWA-2213 and Table IWA-2210-1, remote visual equipment would have to be used or scaffolding would need to be erected and removed to perform the VT examinations. Erecting and removing of scaffolding would cause additional radiation exposure to plant personnel. The NRC staff agrees that this would constitute a hardship for the licensee.

The NRC staff reviewed the licensee's request to use ASME Code Case N-686 in lieu of the requirements of ASME Code, Section XI, Paragraphs IWA-2210 through IWA-2213, and Table IWA-2210-1. Since the 1989 Edition of ASME Section XI (i.e., Code of record for the DAEC third 10-year ISI interval) did not specify distance and illumination requirements for VT examinations, VT-2 and VT-3 visual examination procedures at DAEC were not required to include distance and illumination requirements for visual examinations. The NRC staff finds that industry experience in performing visual examinations to the less prescriptive requirements for proximity and illumination, along with the expertise of qualified visual examiners, provides reasonable assurance of the structural integrity of the components being examined. As such, the NRC staff finds that requiring the licensee to meet the distance and illumination requirements specified in ASME Code, Section XI, 2001 Edition through the 2003 Addenda, would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The NRC staff notes that ASME Code Case N-686 has been approved by the ASME Code Committee and that the participating NRC staff members have not raised objections to the subject Code Case.

Based on the above evaluation, the NRC staff concludes that the proposed use of Code Case N-686 will provide reasonable assurance of structural integrity. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the proposed alternative in RR NDE-R006 is authorized for the remainder of the fourth 10-year ISI interval at DAEC, on the basis that complying with the Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Use of ASME Code Case N-686 is authorized until such time as the code case is published in a future version of RG1.147 and incorporated by reference in 10 CFR 50.55a(b). At that time, if the licensee intends to continue implementing this code case, it must follow all provisions of ASME Code Case N-686 with conditions as specified in RG 1.147 and limitations as specified in 10 CFR 50.55a(b)(5), if any. The NRC staff notes that it has approved without conditions Code Cases N-686 in Regulatory Guide 1.147, Revisions 15. Therefore, this relief is no longer required. The NRC staff notes that it has approved, without conditions, Code Case N-686-1 in RG 1.147, Revision 16. In accordance with 10 CFR 50.55a(b)(5)(ii), the licensee may continue to apply ASME Code Case N-686 until the end of the current 120-month ISI interval or may apply ASME Code Case N-686-1.

3.7 RR NDE-R007

By letter dated June 30, 2006 (ADAMS Accession No. ML ML061870230), as supplemented by two letters dated December 21, 2006 (ADAMS Accession Nos. ML070030516 and ML070110363, respectively), the licensee requested an essentially identical RR NDE-R007 covering the same inspections of the same components as in the August 31, 2011, submittal. The NRC authorized RR NDE-R007 for the fourth 10-year ISI interval through February 21, 2014, the expiration date of the original operating license in an SE dated June 12, 2007 (ADAMS Accession No. ML071380183).

On December 16, 2010, the operating license for the DAEC was renewed, and the license expiration date was extended to February 21, 2034. The fourth 10-year interval is now scheduled to end on October 31, 2016.

In the August 31, 2011, submittal, the licensee stated that the only change to RR NDE-R007 from the previous approval was the change in the duration, from February 21, 2014, to October 31, 2016.

System/Component(s) for Which Relief is Requested For NDE-R007

The licensee asked relief for components that are ASME Code Class 3 with an Examination Category of D-B and Item Number of D2.10. The Examination Category and Item Number are related to the system leakage test of Class 3 pressure retaining components. However, in the proposed alternative, the licensee discussed only buried sections of the River Water Supply, the Emergency Service Water (ESW) system, and the Residual Heat Removal Service Water (RHRSW) system. Therefore, the NRC staff evaluates only for buried sections of the River Water Supply, the ESW system, and the RHRSW piping.

ASME Code Requirements For RR NDE-R007 (as stated)

ASME Section XI, 2001 Edition through the 2003 Addenda, IWA-5244(b) states that for buried components where a VT-2 visual examination cannot be performed, the examination requirement is satisfied by the following:

(1) The system pressure test for buried components that are isolable by means of valves shall consist of a test that determines the rate of pressure loss. Alternatively, the test may determine the change in flow between the ends of the buried components. The acceptable rate of pressure loss or flow shall be established by the Owner.

(2) The system pressure test for non-isolable buried components shall consist of a test to confirm that flow during operation is not impaired.

Reason for Request For RR NDE-R007 (as stated)

IWA-5244(b)(l) requires either a pressure loss test or a test that determines the change in flow between the ends of the buried components for isolable sections of buried piping. The acceptable rate of pressure loss or flow shall be established by the Owner. Sections of River

Water Supply, ESW, and RHRSW system buried piping were not designed with consideration for isolation valves adequate for performing a pressure loss type test or do not contain instrumentation adequate for measuring changes in flow between the ends of the buried piping.

The River Water Supply system contains large diameter buried piping (24 inch diameter) that runs from the River Intake Structure to the Pump House and is greater than 1500 feet in length. The ESW system and the RHRSW system contain large diameter buried piping (a 16-inch diameter for RHRSW and 8-inch and 6-inch diameter for ESW) that runs from the Pump House to the Turbine Building and is greater than 500 feet in length. The subject piping design for these systems did not provide for isolation valves that are capable of supporting a pressure loss type test considering the volume of the piping and the available capacity of test pumps. The system isolation valves were only intended to provide isolation for maintenance activities with only static system pressure.

River Water Supply and ESW were designed with a single-flow element per train located in the pump house. ESW has some additional flow instrumentation on some downstream components, but not for every branch on a train. RHRSW was designed with a single-flow element per train located in the reactor building before the RHR system heat exchanger. Therefore, the installed instrumentation is inadequate for measuring the flow difference at each end of the buried piping. The use of UT flow instrumentation was considered, but the piping configurations do not provide for the straight runs of piping required for accurate flow measurement.

Both the River Water Supply and RHRSW systems include four pumps each with two pumps designated to each of two independent trains. The River Water Supply pumps and RHRSW pumps have installed excess capacity. Therefore, each of the independent trains of both the River Water and RHRSW systems can accommodate a leak and still satisfy the accident analysis requirements. ESW has one pump per train. The ESW system supplies various plant heat exchangers, which have flow margin due to heat transfer requirements.

Licensee's Proposed Alternative and Basis for Requesting Relief NDE-R007 (as stated)

IWA-5244(b)(1) requires the Owner to establish the acceptance criteria for the buried piping test. Since there is no industry guidance for acceptance criteria, DAEC considered that the allowable ASME Operation and Maintenance (OM) Code 2001 Edition, Subsection ISTA, instrument accuracy requirements for pump ISI should be adequate. The Subsection ISTA requires flow instruments with a calibration accuracy of ±2%. Each of the River Water Supply, ESW, and RHRSW pumps are tested in accordance with the DAEC IST program on a quarterly frequency. Each pump test requires approximately 30-minutes to perform. Previously a leak was discovered in nonsafety-related buried piping. The leak was the size of a dime, which demonstrates that small indications are readily identified by visual observation of the surrounding ground surface area on operating systems.

At least one River Water Supply pump is required to be in operation at all times during normal plant power operation. At least one RHRSW pump and one ESW pump are required to be in operation for extended periods of time at the beginning and end of each refueling outage. Therefore, both systems are inservice for extended periods of time and leaks like those

discussed above would be readily identified by plant personnel performing routine inspections during rounds.

DAEC proposes to perform visual examination of the ground surface area immediately above each buried section of River Water Supply, ESW, and RHRSW on a refuel cycle bases in lieu of performing the test required by IWA-5244(b)(l). The visual examinations will be performed only after the subject piping has been in operation at nominal operating conditions for a minimum of 24-hours. The ASME Section XI Code only requires a pressure test once each period (every three to four years).

Duration Of Proposed Alternative For RR NDE-R007 (as stated)

The licensee requested the proposed alternative be approved for the entire fourth ten-year interval of the Inservice Inspection Program for DAEC.

NRC Staff's Evaluation of RR NDE-R007

The Code of Record requires a system pressure test for the buried portion of SW piping that will determine either a rate of pressure loss or a change in flow at the ends of the buried piping. The buried SW piping at DAEC uses butterfly valves at the ends, which were not designed for pressure isolation and, therefore, are unsuitable to determine meaningful rate of pressure loss. One end of buried piping is not instrumented for flow measurement and thus does not permit measurement of change in flow. Therefore, the ASME Code-required test cannot be performed. The ASME Code, however, permits the methodology for nonisolable buried components to confirm that flow during operation is not impaired.

The NRC staff finds that unimpaired flow in the buried piping can be qualitatively assessed during the quarterly service water pump test. Using the downstream flow instrument, a reference flow would correspond to a target pump head. As the pump degrades, the developed head decreases at the reference flow. However, a decrease in pump head may also indicate increase in flow due to any through-wall leakage in the buried piping. From trending of head loss (pressure drop) during a pump test at the reference flow, an assessment can be made on the integrity of buried piping.

The licensee has stated that should the pump test results fall in the required action range of the ASME Code, additional testing and evaluations will be performed accordingly to determine whether the unsatisfactory test results are due to degraded pump performance, or through-wall leakage in the buried portion of piping. For portions of buried piping supplying to cooling loads such as the emergency diesel generator coolers, control building chillers, and the residual heat removal and core spray room coolers, there is flow instrumentation on the supply line to each cooling load. Any marked decrease in supplied flow would be indicative of significant through-wall leakage in the buried piping.

The licensee states that trending of the instrumented critical load flow rates in relation to the upstream set reference flow will ensure integrity of the buried piping. The NRC staff finds that the methodology would provide a qualitative assessment of any significant leakage in the buried piping supplying cooling water to these components. In addition, DAEC also proposes to

perform a visual examination of the ground surface immediately above each buried section of ESW piping, after the subject piping has been in operation for at least 24 hours, once per refueling cycle.

The NRC staff believes that trending of head produced by the pump from the results of quarterly test and ensuring adequate flow through each instrumented critical load, along with the visual examination of ground surface in the proximity of the buried piping, will provide reasonable assurance of integrity of the buried piping in lieu of the Code required test in accordance with IWA-5244(b)(1) of the ASME Code, Section XI. The NRC staff has further determined that compliance with the Code requirement, which would require installation of an additional flow measuring device at the inlet end of the buried piping, would result in hardship to the licensee without a compensating increase in the level of quality and safety.

The NRC staff concludes that, for the buried portion of River Water Supply, ESW, and RHRSW piping, compliance with the Code requirement to perform a test that determines the rate of pressure loss or the change in flow would result in hardship to the licensee without a compensating increase in the level of quality and safety. The licensee's proposed alternative provides reasonable assurance of operational readiness. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the proposed alternative in RR NDE-R007 is authorized for the licensee's fourth 10-year ISI interval.

3.8 RR NDE-R008

By letter dated June 30, 2006 (ADAMS Accession No. ML ML061870230), as supplemented by two letters dated December 21, 2006 (ADAMS Accession Nos. ML070030516 and ML070110363, respectively), the licensee requested an essentially identical RR NDE-R008 covering the same inspections of the same components as in the August 31, 2011, submittal. The NRC authorized Relief Request NDE-R008 for the fourth 10-year ISI interval through February 21, 2014, the expiration date of the original operating license in an SE dated January 31, 2007 (ADAMS Accession No. ML070090357).

On December 16, 2010, the operating license for the DAEC was renewed, and the license expiration date was extended to February 21, 2034. The fourth 10-year interval is now scheduled to end on October 31, 2016.

In the August 31, 2011, submittal, the licensee stated that the only change to RR NDE-R008 from the previous NRC approval was the change in the duration, from February 21, 2014, to October 31, 2016.

Components for Which Relief is Requested For NDE-R008

The licensee stated that the request is applicable to the examination of the reactor pressure vessel (RPV) shell-to-flange weld and head-to flange weld. The Examination Category is B-A and Item numbers are B1.30 and B1.40.

ASME Code Requirements For RR NDE-R008 (as stated)

The Applicable Code Edition for requested relief is Section XI, 2001 Edition through the 2003 Addenda.

ASME Section XI, Appendix I, I-2110(b) currently requires that UT examination, which includes personnel qualification, procedures, scanning and examination requirements of the subject welds be conducted in accordance with Article 4 of Section V for the RPV shell-to-flange weld and head-to-flange weld.

Fourth interval examinations will be performed per the requirements of ASME Section XI, 2001 Edition through the 2003 Addenda, as amended by 10 CFR 50.55a. Per 10 CFR 50.55a(b)(2)(xxiv), the use of Appendix VIII and supplements to Appendix VIII of Section XI of the 2002 Addenda through the 2003 Addenda is prohibited. Therefore, for Appendix VIII and supplements to Appendix VIII, the 2001 Edition of Section XI (no addenda) will be used.

Reason For Request For NDE-R008 (as stated)

In 10 CFR 50.55a it requires that ASME Section XI, Appendix VIII, Supplement 4, "Qualification Requirements for the Clad/Base Metal Interface of Reactor Vessel," and Supplement 6, "Qualification Requirements For Reactor Vessel Welds Other Than Clad/Base Metal Interface," be implemented for most of the RPV welds by November 22, 2000. However, the RPV shell-to-flange weld and head-to-flange weld examinations were not included in this requirement. For these welds, ASME Section XI, Appendix I, I-2110(b) currently requires that UT examination, which includes personnel qualification, procedures, scanning and examination requirements of the subject welds, be conducted in accordance with Article 4 of Section V.

Licensee's Proposed Alternative And Bases For Relief Request NDE-R008 (As Stated)

The use of this alternative will allow the use of PDI-qualified procedures to perform the examination of these welds in lieu of Article 4 of Section V requirements. During the upcoming Fourth Interval examinations, DAEC proposes to perform examinations using, personnel qualification, procedures, scanning, and equipment that are demonstrated and qualified in accordance with ASME Section XI, 2001 Edition (no addenda), Appendix VIII, Supplements 4 and 6, as amended by 10 CFR 50.55a for the RPV shell-to-flange weld, and RPV head-to-flange weld. The examination will be performed manually or automated, as qualified in accordance with ASME Code, Section XI, 2001 Edition (no addenda), Appendix VIII, Supplements 4 and 6, as amended by 10 CFR 50.55a, and the PDI demonstration process.

Since the examination is performed from a single side due to the weld configuration, all procedures, personnel and equipment will be qualified for single-side access for scanning of both welds.

Appendix VIII requirements were developed to ensure the effectiveness of UT examinations within the nuclear industry by means of a rigorous, item-specific performance demonstration. The performance demonstration (through PDI) was conducted on RPV mockups containing flaws of various size and allocations. The demonstration established the capability of

equipment, procedures, and personnel to find flaws that could be detrimental to the integrity of the RPV. The performance demonstration showed that for the detection of flaws in RPV welds, the UT techniques were equal to or surpassed the requirements of Section V, Article 4, of the ASME Code. Additionally, the PDI qualified sizing techniques are considered to be more accurate than the techniques used in Article 4 of Section V.

Although Appendix VIII is not required for the RPV shell-to-flange weld and RPV head-to-flange weld, the use of Appendix VIII, Supplement 4 and 6, criteria for detection and sizing of flaws in these welds will be equal to or will exceed the requirements established by Article 4 of Section V. Therefore, the use of this proposed alternative will continue to provide an acceptable level of quality and safety, and approval is requested pursuant to 10 CFR 50.55a(a)(3)(i).

Duration Of Proposed Alternative For RR NDE-R008 (as stated)

The proposed alternative is applicable for the fourth 10-year ISI interval.

NRC Staff Evaluation Of RR NDE-R008

The 2001 Edition, 2003 Addenda of ASME Code, Section XI, IWA-2232 states, "Ultrasonic examination shall be conducted in accordance with [ASME Code, Section XI] Appendix I." Subarticle I-2120 of Appendix I states that vessels greater than 2 inches in thickness shall be examined in accordance with the ASME Code, Section V, Article 4, as supplemented by Table I-2000-1. Section V, Article 4, provides a prescriptive-based process for qualifying UT of procedures and the scanning requirements for examinations. The prescriptive-based UT uses detailed criteria for setting up and calibrating equipment, calculating coverage, and detecting indications. The capability of a prescriptive-based UT examination is demonstrated with calibration blocks made from representative material containing holes and notches.

Performance-based UT requires that detailed criteria be used for performance demonstration tests. The results for the tests are compared against statistically developed screening criteria. The tests are performed on representative mockups containing flaws similar to those found in operating plants. The NRC staff agrees that the performance-based tests demonstrate the effectiveness of UT personnel and procedures.

In lieu of Subarticle I-2120 of Appendix I to the ASME Code, Section XI, the licensee proposed performing UT examinations of the subject welds in accordance with the 2001 Edition, 2003 Addenda of the ASME Code, Section XI, Appendix VIII, Supplements 4 and 6, as modified by 10 CFR 50.55a. Section 10 CFR 50.55a limits the use of Appendix VIII to the 2001 Edition (with no addenda) of the ASME Code, Section XI. The ASME Code, Section XI, Appendix VIII, is a performance based UT method. Examinations are performed with the scanning requirements for Supplements 4 and 6 that are provided in 10 CFR 50.55a(b)(2)(xv)(G), and the scanning volume identified in the ASME Code, Section XI, Figure IWB-2500-4, for the shell-to-flange weld and Figure IWB-2500-5 for the head-to-flange weld. The scanning requirements are: (1) for the examination of the inner 15 percent through-wall volume, scanning will be performed in four orthogonal directions to the maximum extent possible with procedures and personnel qualified to Appendix VIII, Supplement 4; (2) the remainder of the inner 15 percent through-wall volume is considered fully examined if coverage is obtained in at least one parallel and one perpendicular

direction using personnel and procedures qualified for single-side examination in accordance with Supplement 6; and (3) the remaining 85 percent through-wall volume is considered fully examined if coverage is obtained in one parallel and one perpendicular direction using procedures and personnel qualified for single side examination. Single-side qualification criteria are provided in 10 CFR 50.55a(b)(2)(xv)(G)(2) and 10 CFR 50.55a(b)(2)(xvi). The licensee will follow 10 CFR 50.55a(b)(2)(xv)(G) for the vessel-to-flange and head-to-flange welds.

The NRC staff concludes that the procedures, equipment, and personnel qualified to Appendix VIII through the PDI program have shown a high probability of flaw detection, and have increased the reliability of examinations of weld configurations within the scope of the PDI program. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff finds that the licensee's proposed alternative will provide an acceptable level of quality and safety for the remainder of the fourth 10-year ISI interval at DAEC.

3.9 RR NDE-R009

By letter dated March 28, 2008 (ADAMS Accession No. ML080990626) and supplement dated July 25, 2008 (ADAMS Accession No. ML082180449), the licensee requested an essentially identical RR NDE-R009 covering the same inspections of the same components as in the August 31, 2011, submittal. The NRC authorized RR NDE-R009 for the fourth 10-year ISI interval through February 21, 2014, the expiration date of the original operating license in an SE dated October 3, 2008 (ADAMS Accession No. ML082480680).

On December 16, 2010, the operating license for the DAEC was renewed, and the license expiration date was extended to February 21, 2034. The fourth 10-year interval is now scheduled to end on October 31, 2016.

In the August 31, 2011, submittal, the licensee stated that the only change to RR NDE-R009 from the previous approval was the change in the duration, from February 21, 2014, to October 31, 2016.

ASME Code Component(s) Affected For RR NDE-R009

The licensee stated that the affected component is the ASME Code Class 1 recirculation pump seal flange assembly which includes the seal flange and cartridge.

Applicable Code Edition and Addenda For Relief Request NDE-R009

The DAEC fourth 10-year interval uses the ASME Section XI, 2001 Edition with the 2003 Addenda.

Applicable Code Requirement For RR NDE-R009 (as stated)

The DAEC fourth 10-year interval uses the ASME Code, Section XI, 2001 Edition with the 2003 Addenda.

IWA-4132 "Items Rotated From Stock" states:

"For snubbers and pressure relief valves rotated from stock and installed on components (including piping systems), the following requirements may be used in lieu of all other requirements of IWA-4000, provided the rotation is only for testing the removed items."

(a) Items being removed and installed shall be of the same design and construction.
(b) Items being removed shall have no evidence of failure at the time of removal.
(c) Items being rotated shall be removed and installed only by mechanical means.
(d) Items being installed shall previously have been in service.
(e) Preservice inspections shall be performed as required by IWA-4500.
(f) The Owner shall track the items to ensure traceability of inservice inspection and testing records.
(g) Use of an Inspector and an NIS-2 form are not required.
(h) Testing of removed snubbers, including required sample expansions, shall be performed in accordance with Subsection IWF.

Reason for Request For NDE-R009 (as stated)

IWA-4132 of the 2001 Edition with the 2003 Addenda of ASME Code, Section XI, provides specific requirements for items rotated from stock for the purposes of testing. The items specifically mentioned are snubbers and relief valves. The licensee believes the criteria established in IWA-4132 for snubbers and pressure relief valves for testing can also be applied to the stock rotation of recirculation pump seal flange assemblies for preventative maintenance, given that all the cited stock rotations involve mechanical joints on pressure retaining items and that none of these stock rotations involve a repair/replacement activity.

Nonmandatory Appendix J of the ASME Code. Section XI, provides guidance to help the users of the code determine the applicability of IWA-4000. This appendix establishes that repair/replacement activities are separate from maintenance activities. The examples that are given for repair/replacement activities are:

1. removing weld or material defects;
2. reducing the size of defects to a size acceptable to the applicable flaw evaluation criteria;
3. performing welding or brazing;
4. adding items;
5. system changes, such as rerouting of piping;
6. modifying items;
7. rerating.

The stock rotation of seal flange assemblies does not fall under these examples. The disassembly and re-assembly of the mechanical connection for the stock rotation of spare recirculation pump seal flange assemblies is considered a maintenance activity and thus, the use of IWA-4132 for these activities provides an acceptable level of quality and safety, per 10 CFR 50.55a.

The requirements in IWA-4100 would not apply unless there was a repair/replacement activity performed on the spare recirculation pump seal flange assembly prior to installation.

Proposed Alternative and Basis for Use For RR NDE-R009

The licensee stated that the recirculation pump seal flange assembly consists of the seal cartridge and the seal flange. The seal flange is a pressure boundary component that supports the seal cartridge. The entire assembly (seal flange and seal cartridge) is bolted to the pump casing. During maintenance on the seal cartridge, the complete assembly (seal cartridge and flange) is rotated as a single unit.

The licensee further stated that the normal activity of testing components under the criteria of IWA-4132 involves their removal from their installed location by mechanical means (i.e., disassembly and re-assembly of mechanical joints). IWA-4132 recognizes that, rather than re-install the same component tested, a similar component from stock can be rotated into service in its place. The licensee believes the criteria established in IWA-4132 for stock rotation of snubbers and pressure relief valves for testing can also be applied to the stock rotation of recirculation pump seal flange assemblies for preventative maintenance.

The licensee plans to apply the above criteria in IWA-4132 for stock rotation of recirculation pump seal flange assemblies at DAEC, as described below:

1. The seal flange assembly being installed will be a like-for-like replacement (same design) and built to the same construction code.
2. The seal flange assembly will have no evidence of failure (failure being defined as the pressure boundary failure).
3. The seal flange assembly will be removed and installed by mechanical means.
4. The seal flange assembly will have been previously installed.
5. Preservice and inservice inspections will be completed (i.e. Visual VT-1 of the bolting).
6. As the seal flange assembly is installed, the work will be controlled under the work order process. Unique identification for each item will be tracked and controlled.
7. An Inspector and NIS-2 form will not be used unless the item being installed has been repaired/replaced* in accordance with IWA-4000. (*If there is a repair/replacement activity performed on the item to be installed, DAEC plans to follow IWA- 4000, including the use of an Inspector, NIS-2 form, and pressure testing.)
8. Testing of the seal flange assembly will be completed as needed to determine acceptability.

The licensee has one spare recirculation pump seal flange assembly that will be used as stock rotation for the preventive maintenance. The recirculation pump seal flange assembly is rotated from stock when the mechanical seal starts to show signs of wear prior to its failure. This spare recirculation pump seal flange assembly has been previously installed and subsequently refurbished by replacing seal components which are not pressure retaining. The licensee considers this stock rotation to be a maintenance function (disassembly and re-assembly of mechanical joints) and not a repair/replacement activity per IWA-4000.

Since IWA-4132 does not specifically include the stock rotation of recirculation pump seal flange assemblies, the licensee requests the use of the criteria stated above for the stock rotation of recirculation pump seal flange assemblies as an alternative to the requirements of IWA-4000 for the fourth ten year interval.

The licensee notes that IWA-4132 of the 2004 Edition of the ASME Code, Section XI, includes preventative maintenance in the rotation of stock items. The licensee states that because the basic activity of disassembly and re-assembly of the mechanical joint is the same between the requested activity and that currently permitted, the proposed alternative would provide an acceptable level of quality and safety, and would not adversely impact the health and safety of the public.

Duration of Proposed Alternative For RR NDE-R009

The licensee requested that the proposed alternative be used for the remainder of the DAEC fourth 10-year inspection interval.

NRC Staff Evaluation of Relief Request NDE-R009

The NRC staff evaluated the proposed RR in the following two areas of concern. The first concern is related to whether the proposed stock rotation is considered a maintenance activity or a repair/replacement activity. Under the provisions of the ASME Code, Section XI, the repair/replacement activity requires more actions to be performed, such as inspection and testing, than a maintenance activity. The second concern is related to whether the proposed alternative satisfies the intent of IWA-4132 of the 2001 Edition through 2003 Addenda of the ASME Code, Section XI.

Maintenance Activity vs. Repair/Replacement Activity

Nonmandatory Appendix J of the ASME Code, Section XI, provides guidance to differentiate a maintenance activity from a repair/replacement activity. Article J-3000 of Appendix J provides specific examples of maintenance activities. In particular, subarticle J-3000(d)(2) cites that mechanical seal maintenance is a maintenance activity.

Subarticle IWA-4132 of the 2001 Edition through the 2003 Addenda of the ASME Code, Section XI, allows stock rotation of components. However, the recirculation pump seal flange assembly is not a component allowed by IWA-4132 for the stock rotation. The licensee proposed an alternative which modifies certain requirements in IWA-4132 to the stock rotation of the recirculation pump seal flange assembly at DAEC.

The recirculation pump seal flange assembly consists of the seal cartridge and the seal flange. The seal flange is a pressure boundary component that supports the seal cartridge. The entire assembly (seal flange and seal cartridge) is bolted to the pump casing. During maintenance on the seal cartridge the complete assembly (seal cartridge and flange) is rotated as a single unit (i.e., the existing unit is removed and a refurbished seal flange assembly is installed). The normal activity of testing components under the criteria of IWA-4132 involves their removal from their installed location by mechanical means (i.e., disassembly and re-assembly of mechanical joints). Subarticle IWA-4132 recognizes that rather than re-install the same component tested, a similar component from stock can be rotated into service in its place. The licensee stated that the criteria established in IWA-4132 for stock rotation of snubbers and pressure relief valves for testing can also be applied to the stock rotation of recirculation pump seal flange assemblies for preventative maintenance. The licensee clarified further that the rotation of the recirculation

pump seal flange assembly is a preventative maintenance activity unless an ASME Code, Section XI, repair/replacement activity is being performed in addition to rotation of the seal flange assembly.

The NRC staff reviewed the licensee's explanation described above and finds that the stock rotation of the recirculation pump seal flange assembly may be considered as a maintenance activity because (1) the existing unit is removed and a refurbished seal flange assembly is installed by mechanical means (i.e., disassembly and re-assembly of mechanical joints without welding, brazing, or cold work on the pump), and (2) there is no leakage or structural degradation to the pressure boundary components.

Proposed Alternative vs IWA-4132 Requirements

The NRC staff finds that the requirements (Items 1 thru 8) in the licensee's proposed alternative are consistent with the corresponding eight requirements (Items a to h) of IWA-4132, except Items 5. 7, and 8.

Item 5 of the proposed alternative states that "Preservice and inservice inspections will be completed (i.e., VT-1 of the bolting)" This is different from Item (e) of IWA-4132 which states that "Preservice inspections shall be performed as required by IWA-4500". In the July 25, 2008, letter, the licensee clarified that for the preservice and ISIof the bolting for the flange assembly in Item (5), it will perform the VT-1 examination per IWA-2211, as required by Table IWB-2500-1, Category B-G-2, Item No. B7.60 of the ASME Code, Section XI. The NRC staff notes that the VT-1 examination of the bolting as defined in IWA-2211 does not require leakage identification, which would not be acceptable to the NRC staff. The licensee clarified that if the recirculation pump seal flange assembly is installed during a refueling outage, the Class 1 pressure test, which is required following reactor pressure vessel disassembly associated with refueling, would be used to detect potential leakage even though not required. If the recirculation pump seal flange assembly is installed during an outage other than a refueling outage, the potential for leakage would be detected during the normal leakage walkdown performed when reactor pressure is approximately 400 pounds per square inch gauge (psig) during the startup sequence. The NRC staff finds that although the VT-1 examination does not require leakage identification, it is acceptable that the licensee will perform either a pressure test or a walkdown to detect leakage.

The licensee stated further that in accordance with the ASME Code, Section XI, IWB-2500-1, Category B-G-2, Item No. B7.60, the examination of bolted connection is required only once during the interval when the pump is disassembled for maintenance, repair, or volumetric examination. The licensee clarified that because repair/replacement will not be performed on the pressure boundary, there is no requirement for a volumetric or surface examination. Additionally, an inservice or preservice volumetric or surface examination on this component would not be required when no repair work has been performed.
The NRC staff finds that the pressure test performed after each refueling outage or a walkdown when reactor pressure is about 400 psig provides means to determine the structural integrity of the seal assembly. Therefore, the NRC staff finds that Item (5) in the proposed alternative is acceptable.

Item 7 of the proposed alternative states that "An Inspector and NIS-2 form will not be used unless the item being installed has been repaired/replaced* in accordance with IWA-4000. (*If there is a repair/replacement activity performed on the item to be installed, the licensee plans to follow IWA-4000, including the use of an Inspector, NIS-2 form, and pressure testing.)" This requirement is different from Item (g) of IWA-4132.

The NRC staff finds that the difference is acceptable in that Item 7 of the proposed alternative includes specific requirements in the event a repair/replacement activity is performed. If a repair/replacement activity is performed on the seal flange assembly, the licensee will follow the provisions of IWA-4000, which is consistent with 10 CFR 50.55a. Therefore, the NRC staff finds that Item 7 of the proposed alternative is acceptable.

Item 8 of the proposed alternative states that "Testing of the seal flange assembly will be completed as needed to determine acceptability". This requirement is different from Item (h) of IWA-4132. The NRC staff understands that Item (h) of IWA-4132 is not applicable to the stock rotation of the flange assembly. However, the NRC staff was concerned that the testing in Item 8 will be performed on an "as-needed" basis rather than on a regular basis. In the July 25, 2008, letter, the licensee explained that a post-maintenance test would be performed each time a recirculation pump seal flange assembly is rotated from stock and installed. The post-maintenance test will verify leak tightness when the reactor pressure is approximately 400 psig. Since the recirculation pump seal flange assembly was previously installed, structural integrity is not in question.

The licensee stated that one of the criteria for the use of this RR is that the item used for the stock rotation will have been previously installed (Item 4 in the proposed alternative). This means that a new reactor recirculation pump seal flange assembly cannot be installed under these alternative requirements. The rotated recirculation pump seal flange assembly would have already received a system leakage test when it was new. Since there is also a requirement in IWA-4132 that no repair/replacement activity has been performed (which would be performed on the pressure boundary) there is no need to perform the system leakage test.

The work performed on the stock recirculation pump seal flange assembly would not include any work on the pressure boundary portion of the assembly. The seal flange assembly after installation would be verified to have no leakage during the walkdown when the reactor pressure is approximately 400 psig.

To verify leakage of the recirculation pump seal flange assembly, the licensee will perform either (a) a post-maintenance walkdown at reactor pressure of 400 psig when the stock rotation is conducted during an outage other than a refueling outage, or (b) a Class 1 pressure test when the stock rotation is performed during a refueling outage. The NRC staff finds that either of the above two procedures will verify the structural integrity of the installed seal flange assembly and will be performed on a regular basis.

The NRC staff has determined that RR NDE-R009 will provide an acceptable level of quality and safety for the stock rotation of the recirculation pump seal flange assembly at DAEC.

Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff authorizes the use of RR NDE-R009 for the stock rotation of the recirculation pump seal flange assembly for the remainder of the fourth 10-year ISI interval at DAEC.

3.10 RR NDE-R010

By letter dated July 30, 2009 (ADAMS Accession No. ML092230346), the licensee requested an essentially identical RR covering the same inspections of the same component. This relief was granted in a SE by NRC staff dated June 6, 2010 (ADAMS Accession No. ML101680600). The RR was approved through February 21, 2014, the expiration date of the original operating license.

On December 16, 2010, the operating license for the DAEC was renewed, and the license expiration date was extended to February 21, 2034. The fourth 10-year interval is now scheduled to end on October 31, 2016.

In the submittal, the licensee stated that the only change to the RRs from the previous approval was the change in the duration, from February 21, 2014, to October 31, 2016.

This SE uses information from the original RR dated July 30, 2009, and responses to RAIs dated February 25, 2010 (ADAMS Accession No. ML100680431) and June 15, 2010 (ADAMS Accession No. ML101660124).

ASME Code Requirement

Section XI (2001 Edition with the 2003 Addenda), Subarticle IWB-2500 states, in part, that, "components shall be examined and tested as specified in table IWB-2500-1." Table IWB-2500-1, Category B-A, Item B1.40 (reactor vessel head-to-flange weld), require a volumetric examination of applicable Class 1 pressure retaining welds, including essentially 100 percent of the weld length once during the 10-year ISI interval.
ASME Code, Section XI, Examination Category B-A, Item B1.40, requires 100 percent volumetric examination, as defined by Figure IWB-2500-5, as applicable, of the head-to-flange weld on the RPV with the required examination volume defined in the figure. 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 RG 1.147, Revision 14, *Inservice Inspection Code Case Acceptability* (RG 1.147), 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.
ASME Code of Record

The Code of Record for the fourth ISI interval at DAEC is the ASME Code. Section XI, 2001 Edition up to the 2003 Addenda. The fourth 10-year ISI interval began on November 1, 2006, and is scheduled to end on October 31, 2016.

Licensee's ASME Code for RR

In accordance with 10 CFR 50.55a(g)(6)(i), the licensee requested relief from the ASME Code required 100 percent volumetric examination for the Category B-A, Item B1.40, reactor vessel head-to-flange weld.

Licensee's Basis for RR

The licensee's basis for the RR was that parameters for ISI accessibility were not requirements at the time when DAEC was designed and built, and, therefore, accessibility was not necessarily reflected in the design and construction. The reactor vessel was designed and installed to the requirements of ASME Section III, 1965 Edition, with the Summer 1967 Addenda.
The licensee has performed the required volumetric inspection on the reactor vessel head-to-flange weld, but the examination coverage was limited to 76.05 percent due to the weld configuration. The SE dated January 31, 2007 (ADAMS Accession No. ML070090357), approved the use of a specific NDE procedure as an alternative to the ASME Code-required examination that the NRC authorized for the remainder of the fourth ISI interval at DAEC. The NDE procedure incorporated the examination techniques qualified under the ASME Code, Section XI, Appendix VIII, PDI. DAEC performed examinations qualified under ASME Code, Section XI, Appendix VIII, that achieved the maximum practical amount of coverage obtainable within the limitations imposed by the design of the components; the "essentially" 100 percent coverage is impractical. The licensee concludes that they have met the ASME Code requirements to the extent practical.
Duration of Proposed Alternative

Relief is requested for the remainder of the fourth 10-year interval of the ISI program for the DAEC.

NRC Staff Evaluation

This RR is essentially an extension of the relief granted on July 30, 2010, until the end of the now-extended fourth ISI interval. It is worth noting that no relevant issues have emerged since the previous SE that would affect the relief granted on July 30, 2010.

As indicated previously, the NRC staff has considered this request for relief in light of the limitations found in older plants. Complete examination of the reactor vessel head-to-flange weld is restricted by the geometric configuration. Imposing this requirement would place a significant burden on the licensee. The NRC staff finds that implementation of the RR 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 ASME Code requirements were imposed on DAEC. Therefore, the ASME Code-required 100 percent volumetric examinations are impractical. Additionally, no indications were found over the inspection coverage obtained, and the fact that the VT-2 examination that is performed on the system during system pressure tests each outage did not find any sign of leakage, the NRC staff concludes that if significant service-induced degradation had

occurred, there is reasonable assurance that evidence of it would have been detected by the examination that was performed. As such, the NRC staff further concludes, pursuant to 10 CFR 50.55a(g)(6)(i), that there is reasonable assurance of structural integrity of the subject welds based on the examinations that have been performed for the remainder of the fourth 10-year ISI interval.

3.11 RR NDE-R011

By letter dated February 24, 2007 (ADAMS Accession No. ML070660482), supplemented by letters dated February 26, 2007 (ADAMS Accession No. ML070660463), and February 28, 2007 (ADAMS Accession No. ML07010457), the licensee requested an essentially identical RR covering the same inspections of the same components. This relief was granted in a SE by NRC staff dated June 12, 2007 (ADAMS Accession No. ML071110007). Relief was requested for the use of Code Cases N-504-2 and N-638-1 for weld overlay repairs as an alternative to ASME Section XI repair requirements for components RRC-F002 (recirculation inlet nozzle safe-end weld) and RRF-F002 (recirculation inlet nozzle safe-end weld). On March 6, 2007, verbal authorization of the licensee's proposed alternatives was granted. As documented in licensee event report #2007-003-00 (ADAMS Accession No. ML071150319), overlay repairs to both welds were completed. By letter dated December 21, 2012, the licensee stated, "The weld overlays were installed in 2007 and no work is ongoing that requires additional relief for these welds. No extension of relief is requested." Therefore, the NRC staff concludes that RR NDE-R011 is not applicable for review.

3.12 RR NDE-R012

By letter dated July 31, 2007 (ADAMS Accession No. ML072220137), as supplemented by letter dated February 19, 2008 (ADAMS Accession No. ML080590357), the licensee requested an essentially identical RR covering the same inspections of the same component. This relief was granted in a SE by NRC staff dated July 2, 2008 (ADAMS Accession No. ML081680709),.

On December 16, 2010, the operating license for the DAEC was renewed, and the license expiration date was extended to February 21, 2034. The fourth 10-year interval is now scheduled to end on October 31, 2016.

In the submittal, the licensee stated that the only change to the relief requests from the previous approval was the change in the duration, from February 21, 2014, to October 31, 2016.

ASME Code Requirement

Under the rules of ASME Code, Section XI, IWA-4221, "Construction Code and Owner's Requirements," the ASME Code states that: "(a) An item to be used for repair/replacement activities shall meet the Owner's Requirements."

ASME Code of Record

The Code of Record for the fourth 10-year ISI interval at DAEC is the ASME Code, Section XI, 2001 Edition up to the 2003 Addenda. The fourth 10-year ISI interval began on November 1, 2006.

Licensee's ASME Code RR

The licensee requests relief from IWA-4221 to allow weld procedure specifications for seal welding of the installed and spare main steam relief valves (MSRVs) to be post-production qualified in accordance with ASME Code, Section IX, requirements.

Licensee's Basis for RR

The original welding procedure specifications (WPSs) used for the seal welding of the subject components were qualified in accordance with Target Rock Procedure (TRP)-1139 rather than ASME Code requirements. TRP-1139 included requirements for multiple surface NDE and macro examinations of sectioned specimens. TRP-1139 classified both the seat-to-body and the bellows-to-spacer plate seal welds as "Special Welds." TRP-1139 required qualification welds for "Special Welds" to receive a liquid penetrant (LP) examination as part of acceptance. The procedure qualification records (PQRs) (Target Rock referred to these as "Metallurgical Test Reports") show that an LP examination of the root and final passes for the bellows-to-spacer plate qualification seal weld and an LP examination of each pass for the seat-to-body qualification seal weld were performed. The acceptance criteria listed in TRP-1139 for the LP examinations states, "Liquid penetrant inspection shall not disclose any linear indications or cracks, and no rounded indications exceeding 1/32 inch diameter. A maximum of five indications (1/32 inch diameter) shall be permitted per linear inch of weld." TRP-1139 also states that qualification welds for "Special Welds" shall be metallographically examined with sufficient microspecimens (four maximum) to fully evaluate fusion to base metal, penetration, weld bead contour, soundness, grain size, heat affected zone in base metal, etc." TRP-1139 acceptance criteria for macro examination of qualification welds states, "Metallographic examination shall show sufficient (but not excessive) penetration, a good sound fusion zone, a weld bead contour which follows the joint geometry, freedom from porosity exceeding .010 inch diameter and no cracks." The workmanship samples used for procedure qualification listed on the metallurgical test reports were polished, etched, and examined under magnification. The three affected production seal welds on each MSRV are the bellows-to-spacer plate seal weld, the pilot seat-to-body seal weld, and the second stage seat-to-body seal weld.

The 1968 Edition, winter 1968, Addenda of ASME Code, Section III, did not include fabrication requirements for valves or provide any requirements for seal welding. General Electric Design Specification 21 A9206, Revision 6, required WPSs to be qualified in accordance with ASME Code, Section IX. The 1968 Edition of ASME Code, Section IX, should have been used to qualify the WPSs for seal welding, since the 1968 Edition of ASME Code, Section IX, Paragraph Q-10 (b), requires all welding to be qualified using reduced section tension specimens and guided bend specimens.

The TRP has completed three PQRs using the same seal welding parameters as in the original WPSs for seal welding. Weld coupons were tested in accordance with the 2004 Edition through 2006 Addenda of ASME Code, Section IX. All tensile and bend tests were found to be acceptable per ASME Code, Section IX, requirements. All three WPSs for seal welding have been revised to reference the new PQRs that were qualified via tensile and bend testing. These post-production PQRs verify that the seal welds made with the original WPSs for seal welding meet all tensile and bend test requirements and justify continued use. The revised WPSs for

seal welding that now reference the new PQRs will be used during future repair/replacement activities, if performed by Target Rock. In addition, TRP performed the following NDE on the affected production welds after the current repair/replacement activities were performed. Both the seat-to-body and bellows-to spacer plate production seal welds were subject to a LP examination of their root and final passes. The acceptance criteria are provided in NWS Technologies LP procedure, NWS-NDE-P- 01, Revision 2, which meets ASME Code, Section III, Subsection NB (Class 1) requirements. NWS-NDE-P-01, Revision 2 is written to comply with ASME Code, Section III, Subsection NB, 1992 Edition through 1993 addenda. The ASME Code, Section III, Subsection NB, LP acceptance criteria are unchanged up to the current 2007 Edition.

Section XI allows the Owner to follow the original Construction Code requirements, or the requirements of newer edition/addenda of the Construction Code. Therefore, the use of NWS-NDE-P-01, Revision 2, meets the requirements of ASME Code, Section XI, 2001 Edition through 2003 Addenda. The method and number of tests (LP examination of root and final passes) exceed ASME Code, Section III, Subsection NB, requirements. ASME Code, Section III, Subsection NB, requires either an LP or a magnetic particle examination to be performed on the final weld surface.

Duration of Proposed Alternative

Relief is requested for the remainder of the fourth 10-year interval of the ISI program for the DAEC.

NRC Staff Evaluation

This RR is essentially an extension of the relief granted on July 2, 2008, until the end of the now-extended fourth ISI interval. It is worth noting that no relevant issues have emerged since the previous SE that would affect the relief granted on July 2, 2008.

The NRC staff concludes that the proposed Request for Alternative to allow WPSs for seal welding of the installed and spare MSRVs to be post-production qualified in accordance with ASME Code, Section IX, requirements is acceptable and compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the NRC staff authorizes the proposed alternatives related to the seal welding of the installed and spare MSRVs.

3.13 RR NDE-R013

By letter dated February 28, 2008 (ADAMS Accession No. ML080710428), the licensee requested an essentially identical RR covering the same inspections of the same component. Relief was granted in a SE by NRC staff dated August 29, 2008 (ADAMS Accession No. ML082040046).

On December 16, 2010, the operating license for the DAEC was renewed and the license expiration date was extended to February 21, 2034. The fourth 10-year interval is now scheduled to end on October 31, 2016.

In the submittal, the licensee stated that the only change to the relief requests from the previous approval was the change in the duration, from February 21, 2014 to October 31, 2016.

ASME Code Requirement

The licensee requested relief from the following requirements of ASME Code, Section XI, 2001 Edition, 2003 Addenda:

> Table IWB-2500-1 "Examination Category B-D, Full Penetration Welded Nozzle in Vessels - Inspection Program B."
>
> Class 1 nozzle-to-vessel weld and nozzle inner radii examination requirements are given in Item Number B3.90 "Nozzle-to-Vessel Welds" and B3.100 "Nozzle Inside Radius Section."

The method of examination is volumetric. All nozzles with full penetration welds to the vessel shell (or head) and integrally cast nozzles are examined each interval. All of the nozzle assemblies identified in Enclosure 2 to the February 28, 2008, submittal,are full penetration welds.

ASME Code of Record

The Code of Record for the fourth 10-year ISI interval at DAEC is the ASME Code, Section XI, 2001 Edition up to the 2003 Addenda. The fourth ISI interval began on November 1, 2006.

Licensee's ASME Code Relief Request

The licensee submitted a request for relief from ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," regarding examination of RPV nozzle to vessel welds and nozzle inner radii at DAEC. Instead, the licensee proposed to use an alternative in accordance with ASME Code Case N-702, Alternative Requirements for BWR Nozzle Inner Radius and Nozzle-to- Shell Welds. The technical basis for ASME Code Case N-702 was documented in an EPRI report by Boiling-Water Reactor Vessel and Internals Project (BWRVIP), "BWRVIP-108: BWR Vessel and Internals Project, Technical Basis for the Reduction of Inspection Requirements for the Boiling-Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Inner Radii," which was approved by the NRC in an SE dated December 19, 2007, (ADAMS Accession No. ML073600374).

Licensee's Proposed Alternative to the ASME Code

Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested from performing the required examinations on 100 percent of the identified nozzle assemblies. As an alternative for all welds and [nozzle] inner radii except for the Recirculation Outlet welds, DAEC proposes to

[volumetrically] examine a minimum of 25 percent of the nozzle-to-vessel welds and inner radius sections, including at least one nozzle from each system and nominal pipe size, in accordance with [ASME] Code Case N-702.

Licensee's Basis for RR

The December 19, 2007, SE for BWRVIP-108 specified plant-specific requirements which must be met for applicants proposing to use this alternative. The licensee submittal intended to demonstrate that the relevant DAEC RPV nozzle-to-vessel welds and nozzle inner radii meet the plant-specific requirements so that the relief request can be granted.

The BWRVIP-108 provides the basis for ASME Code Case N-702. The evaluation found that failure probabilities at the nozzle blend radius region and nozzle-to-vessel shell weld due to a low temperature overpressure event are very low with or without ISI. The report concludes that inspection of 25 percent of each nozzle type is technically justified. In the SE, Section 5.0, "Plant-Specific Applicability" indicates that each licensee who plans to request relief from the ASME Code, Section XI, requirements for RPV nozzle-to-vessel shell welds and nozzle inner radius sections may reference BWRVIP-108 report as the technical basis for the use of ASME Code Case N-702 as an alternative. However, each licensee should demonstrate the plant-specific applicability for the BWRVI P-1 08 report to its units in the RR by showing that all the general and nozzle-specific criteria addressed below are satisfied:

(1) The maximum RPV heatup/cooldown rate is limited to less than 115 °F per hour. The DAEC surveillance that monitors reactor vessel heatup/cooldown (Surveillance Test Procedure 3.4.9-01) limits the rate to less than or equal to 100°F/hr for Curve B and less than or equal to 20°F/hr for Curve A.

(2) For the Recirculation Inlet Nozzles the following criteria must be met:
(a) (pr/t)/CRPV <1.15, the calculation for the DAEC N2 Nozzle results in 0.9748 which is less than 1.15/ and (b) [p(ro2 +ri2)/(ro2-ri2)]/CNOZZLE <1.15, the calculation for the DAEC N2 Nozzle results in 1.0923 which is less than 1.15.

(3) For the Recirculation Outlet Nozzles the following criteria must be met:
(a) (pr/t)/CRPV <1.15, the calculation for the DAEC N1 Nozzle results in 1.17 which is higher than 1.15, and
(b) [p(ro2 +ri2)/(ro2-ri2)]/CNOZZLE <1.15, the calculation for the DAEC N1Nozzle results in 0.87 which is less than 1.15.

Based upon the above information, all RPV nozzle-to-vessel shell welds and nozzle inner radii sections, with the exception of the recirculation outlet nozzles, meet the criteria and therefore ASME Code Case N-702 is applicable. However, the recirculation outlet nozzles do not meet all of the criteria and ASME Code Case N-702 would not be applied.

Therefore, use of ASME Code Case N-702 provides an acceptable level of quality and safety pursuant to 10 CFR 50.55a(a)(3)(i) for all RPV nozzle-to-vessel shell welds and nozzle inner radii sections, with the exception of the recirculation outlet nozzles.

NRC Staff Evaluation

This RR is essentially an extension of the relief granted on August 29, 2008 until the end of the now-extended fourth ISI interval. No relevant issues have emerged since the previous SE that would affect the relief granted on August 29, 2008. The NRC staff has reviewed the licensee's submittal and finds that relevant information is consistent with the information provided by letter dated February 28, 2008. NRC staff reviewed the previous submittal and NRC staff SE, and confirmed that the DAEC RPV meets four of the five plant-specific criteria specified in the December 19, 2007, SE on the BWRVIP-108 report, which provides technical bases for use of ASME Code Case N-702. The only plant-specific criterion that was not met regarded the evaluation of the DAEC recirculation outlet nozzles, which were excluded from the scope of this request. Consequently, pursuant to 10 CFR 50.55a(a)(3)(i), relief is authorized for the remaining portion of the fourth 10-year ISI interval from the requirements of Table IWB-2500-1 (Inspection Program B) of ASME Code, Section XI, pertaining to inspection of the RPV nozzle-to-vessel shell welds and inner radii for nozzles specified in the licensee's submittal, and an alternative of using ASME Code Case N-702 is authorized because an acceptable level of quality and safety can be maintained. This determination has considered the licensee's intention to perform volumetric examinations for all the affected nozzle inner radii.

3.14 RR NDE-R014

RR NDE-R014 requested relief for the installation of a weld overlay RRA-F002A and RRA-J003 welds. By letter dated December 21, 2012, the licensee stated that the weld overlay was installed in 2010, and no work is ongoing that requires additional relief for these welds. No extension of relief is requested." NRC staff has confirmed completion of the weld overlay and therefore, the NRC staff concludes that RR NDE-R014 is not applicable for review.

3.15 RR NDE-R015

RR NDE-R015 requested authorization of an alternative regarding pressure test requirements. By letter dated December 21, 2012, the licensee stated that "[t]he request was a one-time-only alternative for PSV 4402 during refueling outage (RFO) 22 (2010). No extension of relief is requested." Given the completion of RFO 22 in 2010, the NRC staff concludes that RR NDE-R014 is not applicable for review.

4.0 CONCLUSION

In the August 31, 2011, submittal, as supplemented, the licensee stated that the only change to the RRs from the previous approvals was the change in the duration, from February 21, 2014. to October 31, 2016. The DAEC fourth 10-year ISI inspection plan was artificially truncated to coincide with the expiration of the original operating license on February 21, 2014. On December 16, 2010, the DAEC operating license was extended to February 21, 2034. Therefore, the licensee has requested that the previously issued SEs be revised to address the entire fourth 10-year ISI interval for DAEC which began on November 1, 2006, and ends on October 31, 2016.

Based on its review, the NRC staff concludes that RRs, as identified in Enclosure 1, are essentially extensions for relief that has been granted previously. The NRC staff review of the

licensee's August 31, 2011, submittal, found that the relevant information was identical to information provided in the previous relief requests. The NRC staff review also determined that no relevant issues have emerged since the previous SEs that would affect the RRs granted earlier.

Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff concludes that Relief Requests NDE-R001, R002, R003, R005, R008, R009, and R013, are acceptable and provide an acceptable level of quality and safety through the fourth 10-year ISI interval which ends on October 31, 2016. For reasons stated in Enclosure 1, the NRC staff acknowledges that NDE-R004 is no longer needed.

The NRC staff concludes that, for RRs NDE-R006, R007, and R012, compliance with the ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the NRC staff authorizes use of RRs NDE-R006, R007, and R012, through the fourth 10-year ISI interval which ends on October 31, 2016.

The NRC staff finds that implementation of RR NDE-R010 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 ASME Code requirements were imposed on DAEC. The NRC staff concludes that there is reasonable assurance of structural integrity of the subject welds based on the examinations that have been performed for the remainder of the fourth 10-year ISI interval. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), the NRC staff grants use of RR NDE-R010 through the fourth 10-year ISI interval which ends on October 31, 2016.
In its letter dated December 21, 2012, the licensee stated, "The weld overlays were installed in 2007 and no work is ongoing that requires additional relief for these welds. No extension of relief is requested." Therefore, the NRC staff concludes that RR NDE-R011 is not applicable for review.

Further, in its letter dated December 21, 2012, the licensee stated that "[t]he request was a one-time-only alternative for PSV 4402 during RFO 22 (2010). No extension of relief is requested." Given the completion of RFO 22 in 2010, the NRC staff concludes that Relief Request NDE-R014 is not applicable for review.

As stated above, the NRC staff has authorized use of RR NDE-R006. However, the NRC staff finds that RR NDE-006 may not be needed. The NRC authorized the original relief request until such time as ASME Code Case N-686 is approved in Regulatory Guide 1.147. The NRC staff has noted that ASME Code Case N-686 has been approved in Revision 15 of RG 1.147, without conditions. The NRC staff also notes that ASME Code Case N-686-1 has been approved without conditions in RG.147, Revision 16. As such, in accordance with 10 CFR 0.55a(b)(5)(ii), the licensee may continue to apply ASME Code Case N-686 until the end of the current 120-month ISI interval or may apply ASME Code Case N-686-1.

All other ASME Code, Section XI, requirements for which relief was not specifically requested, and approved, in these RRs remains applicable, including third-party review by the authorized Nuclear Inservice Inspector.

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1. RR NDE-R004 is no longer needed.

2. Time extensions for the following RRs are not needed: RRs NDE-R011, R014, R015 in Enclosure 1 are essentially extensions for reliefs that have been granted previously. The NRC staff review of the licensee's submittal found that the relevant information was identical to information provided in the previous relief requests. The NRC staff review also determined that no relevant issues have emerged since the previous safety evaluations that would affect the relief granted earlier. Therefore, the NRC staff concludes that the licensee's relief requests listed in Enclosure 1 and remaining in effect, are acceptable and provide an acceptable level of quality and safety.

All other American Society of Mechanical Engineers and Boiler and Pressure Vessel Code, Section XI, requirements for which relief was not specifically requested and approved remain applicable, including third-party review by the authorized Nuclear Inservice Inspectors.

If you have any questions, please contact the Project Manager, Karl Feintuch at 301-415-3079 or via e-mail at Karl.Feintuch@nrc.gov

Sincerely,

/RA/

Robert D. Carlson, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-331

Enclosures:
1. Relief Requests Summary
2. Safety Evaluation

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