August 6, 2007

Mr. Bruce H. Hamilton
Vice President, Oconee Site
Duke Power Company LLC
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3, RELIEF REQUEST NOS. 06-ON-004 AND 07-ON-001, ALTERNATIVES TO WELD OVERLAYS (TAC NOS. MD2887, MD2888, MD2889, MD4764, AND MD4765)

Dear Mr. Hamilton:

We have completed our review and evaluation of the information that you provided in a letter dated August 24, 2006, as supplemented by letters dated September 11, October 5, October 26, and November 27, 2006, and March 12, 2007, that requested relief from certain American Society of Mechanical Engineers (ASME), *Boiler and Pressure Vessel Code* (Code), Section XI requirements at Oconee Nuclear Station, Units 1, 2, and 3. Specifically, you submitted Relief Request (RR) Nos. 06-ON-004 and 07-ON-001, requesting relief from the requirements of the ASME Code pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a(a)(3)(i). Modifications to ASME Code Cases N-504-2, N-638-1, and alternatives to ASME Code, Appendix VIII, Supplement 11, were submitted for the purpose of performing preemptive full structural weld overlays on pressurizer spray, relief, safety, and surge nozzle safe-ends.

In the supplemental letter dated October 5, 2006, you retracted the portions pertaining to Units 2 and 3 from 06-ON-004 based on a September 20, 2006, teleconference with the Nuclear Regulatory Commission staff. In the supplemental letter dated March 12, 2007, you submitted RR No. 07-ON-001, which is identical in repair methodology to RR No. 06-ON-004. Therefore, this safety evaluation applies to Oconee Nuclear Station, Units 1, 2, and 3, and both of the subject relief requests.

Verbal relief for Unit 1 was granted on October 30, 2006, and verbal relief for Unit 2 was granted on May 17, 2007.

Based on the enclosed safety evaluation, we find alternative proposed in Inservice Inspection Program, RR Nos. 06-ON-004 and 07-ON-001 provides an acceptable level of quality and safety, in accordance with the 10 CFR 50.55a(a)(3)(i). The proposed relief in therefore granted.

Sincerely,

/RA/

Evangelos C. Marinos, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosure:
Safety Evaluation

cc w/encl: See next page

Verbal relief for Unit 1 was granted on October 30, 2006, and verbal relief for Unit 2 was granted on May 17, 2007.

Based on the enclosed safety evaluation, we find alternative proposed in Inservice Inspection Program, RR Nos. 06-ON-004 and 07-ON-001 provides an acceptable level of quality and safety, in accordance with the 10 CFR 50.55a(a)(3)(i). The proposed relief in therefore granted.

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

INSERVICE INSPECTION PROGRAM

RELIEF REQUEST NOS. 06-ON-004 AND 07-ON-001

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3

DUKE POWER COMPANY LLC

DOCKET NOS. 50-269, -270, -287

1.0 INTRODUCTION

By letter dated August 24, 2006, as supplemented by letters dated September 11, October 5, October 26, and November 27, 2006, and March 12, 2007, Duke Power Company LLC (the licensee) submitted Relief Request (RR) Nos. 06-ON-004 and 07-ON-001, requesting relief pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a(a)(3)(i) from the repair requirements of the American Society of Mechanical Engineers (ASME), *Boiler and Pressure Vessel Code* (Code), Code Cases, N-504-2, "Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping, Section XI, Division 1 (N-504-2)," N-638-1, "Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique (N-638-1)," and Appendix VIII, Supplement 11 to the 1995 edition including 1996 addenda of the ASME Code, Section XI. In its supplemental letter dated October 5, 2006, the licensee retracted the portions of 06-ON-004 pertaining to Units 2 and 3 based on a September 20, 2006, teleconference with the U.S. Nuclear Regulatory Commission (NRC) staff. In its supplemental letter dated March 12, 2007, the licensee submitted RR No. 07-ON-001, which is identical in repair methodology to RR No. 06-ON-004. Therefore, this safety evaluation applies to Oconee Nuclear Station (ONS), Units 1, 2, and 3, but RR No. 06-ON-004 is only for Unit 1 and RR No. 07-ON-001 is only for Units 2 and 3. The alternative, which includes modifications to code cases N-504-2 and N-638-1, would be used to perform preemptive full structural weld overlays on specific welds on pressurizer relief, safety, spray and surge nozzles, as well as reactor coolant piping surge line to leg nozzle and spray safe end to pipe welds at ONS Units 1, 2, and 3.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests

conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The ISI Code of record for ONS Units 1, 2, and 3 for the fourth 10-year ISI interval is the 1998 edition of the ASME Code through the 2000 addenda. In accordance with 10 CFR 50.55a(g)(6)(ii)(C)(1), the implementation of Supplements 1 through 8, 10, and 11 of Appendix VIII to Section XI, 1995 edition with the 1996 addenda of the ASME Code, was required on a phased schedule ending on November 22, 2002. Supplement 11 was required to be implemented by November 22, 2001.

Additionally, 10 CFR 50.55a(g)(6)(ii)(C)(2) requires licensees implementing the 1989 edition and earlier editions of paragraph IWA-2232 of Section XI of the ASME Code to implement the 1995 edition with the 1996 addenda of Appendix VIII and supplements to Appendix VIII of Section XI of the ASME Code.

Pursuant to 10 CFR 50.55a(g)(4)(iv), ISI items may meet the requirements set forth in subsequent editions and addenda of the ASME Code that are incorporated by reference in 10 CFR 50.55a(b), subject to the limitations and modifications listed therein, and subject to Commission approval. Portions of editions and addenda may be used provided that related requirements of the respective editions and addenda are met.

Pursuant to 10 CFR 50.55a(a)(3) alternatives to requirements may be authorized by the NRC if the licensee demonstrates that: (i) the proposed alternative provides 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 licensee submitted the subject relief requests pursuant to 10 CFR 50.55a(a)(3)(i) to propose alternatives to the implementation of the ASME Code, Section XI, Appendix VIII, Supplement 11, and alternatives that are modifications to N-504-2 and N-638-1 for the application of preemptive full structural weld overlays.

3.0 TECHNICAL EVALUATION

3.1 Code Requirements for which Relief is Requested

Under the rules of IWA-4420 and IWA-4520(a), repairs shall be performed in accordance with the licensee's design specification and the original Construction Code. IWA-4430 and IWA-4600 provide for alternative welding methods when the requirements of IWA-4420 cannot be met. IWA-4530 requires a preservice examination to be performed in accordance with IWB-2200. Table IWB-2500-1 Categories B-F and B-J prescribe inservice examination requirements for Class 1 butt welds. IWA-4421 allows later editions and addenda of the Construction Code or of ASME Code Section III, either in their entirety or portions thereof, and Code Cases may be used.

The Code requirements for which relief is requested are N-638-1 and N-504-2, with conditions as specified in Regulatory Guide (RG) 1.147, Revision 14, and ASME Code, Section XI, 1995 edition including addenda through 1996, and Appendix VIII, Supplement 11, which is required to be implemented per 10 CFR 50.55a(g)(6)(ii)(c).

3.2 Licensee's Proposed Modifications to N-504-2

The licensee proposed to use N-504-2 as an alternative to the mandatory ASME Code repair provisions with the following modifications for full structural weld overlays:

- Use of a nickel-based alloy weld material, Alloy 52/52M/52MS rather than the low carbon (0.035% maximum) austenitic stainless steel.

- Relaxation from the requirement to perform delta ferrite measurements to meet the 7.5 Ferrite Number requirement of N-504-2. The Ferrite Number requirement cannot be met because the Alloy 52/52M/52MS weld material is 100-percent austenitic and contains no delta ferrite.

- In lieu of a hydrostatic test, a system leakage test and an ultrasonic examination (UT) will be performed in accordance with ASME Code, Section XI, IWA-4540(a)(2), as modified by Appendix Q.

3.3 Licensee's Basis for Relief

The licensee stated that the weld overlay has been designed consistent with the requirements of N-504-2 with the specific thickness and length computed according to the guidance provided in the subject Code Case. The licensee stated that Alloy 52/52M/52MS material is highly resistant to primary water stress corrosion cracking (PWSCC) and that industry operational experience has shown that PWSCC in Alloy 82/182 will blunt at the interface with stainless steel base metal, ferritic base metal, or Alloy 52/52M/52MS weld metal. The 360 ° structural weld overlay will control growth in any PWSCC crack and maintain weld integrity. The weld overlay will induce compressive stress in the weld, thus impeding growth of any reasonably shallow cracks.

The weld metal used will be Alloy 52/52M/52MS, which is an austenitic nickel alloy. These filler materials were selected for their improved resistance to PWSCC. Alloys 52 and 52M contain about 28 to 31.5 percent chromium that imparts excellent corrosion resistance. The existing Alloy 82/182 weld and the Alloy 52M/52M/152 overlay are nickel based and have ductile properties and toughness similar to austenitic stainless steel piping welds at pressurized water reactor operating temperature. These filler materials are suitable for welding over the ferritic nozzle, Alloy 82/182 weld and the austenitic stainless steel materials.

Paragraph (e) of N-504-2 requires as-deposited delta ferrite measurements of at least 7.5 Ferrite Number (FN) for the weld reinforcement. The licensee proposed that delta ferrite measurements will not be performed for this overlay because the deposited Alloy 52/52M/52MS is 100-percent austenitic and contains no delta ferrite due to the high nickel composition (approximately 60-percent nickel).

The licensee stated that application of IWA-4540(a)(2) for a system leakage test in lieu of a system hydrostatic test requires performance of nondestructive examination (NDE) in accordance with the methods and acceptance criteria of the applicable Subsection of the 1992 edition of ASME Code, Section III. ASME Code, Section III, Subsection NB, Article 5000 for examination does not address the structural weld overlay type configuration. The non-destructive examination (NDE) requirements of Nonmandatory Appendix Q will be

followed for the required NDE in lieu of ASME Code, Section III. Code Case N-504-2 and Nonmandatory Appendix Q provide appropriate examination requirements including examination volume, acceptance criteria, and examination methods per Appendix VIII.

3.4 NRC Staff's Evaluation of Modifications to N-504-2

Under IWA-4420, in editions and addenda up to and including the 1998 edition with the 2000 addenda, repairs shall be performed in accordance with the Owner's Design Specification and the original Construction Code of the component or system. Later editions and addenda of the Construction Code, or of Section III, either in their entirety or portions thereof, and Code Cases may be used. In addition to the above requirements, defects shall be removed or reduced in size in accordance with IWB-3640. Alternatively, the component may be evaluated and accepted in accordance with the design rules of either the Construction Code, or Section III, when the Construction Code was not Section III. N-504-2 is being used by the licensee to perform full structural weld overlays on the ONS Unit 1 reactor coolant system welds listed in Section 1.0 of its August 24, 2006, submittal as a preemptive measure against cracking due to PWSCC.

N-504-2 was conditionally approved by the staff for use under RG 1.147, Revision 14. The condition specified the use of Nonmandatory Appendix Q, which provides the NDE methods, volume and acceptance criteria for the weld overlay. Therefore, the use of the modified N-504-2 as an alternative to the mandatory ASME Code repair provisions is acceptable to the NRC staff, provided that all conditions and provisions of N-504-2, which is currently approved by the NRC staff under RG 1.147, Revision 14, are complied with. The license has proposed modifications to N-504-2.

The first proposed modification to the N-504-2 provisions involves the use of a nickel-based alloy weld material, rather than the low carbon austenitic stainless steel. The licensee stated that paragraph (b) of N-504-2 requires that the reinforcement weld material shall be low carbon (0.035 percent maximum) austenitic stainless steel. In lieu of the stainless steel weld material, Alloy 52/52M/52MS, a consumable welding wire highly resistant to PWSCC, was proposed for the overlay weld material. The NRC staff notes that the use of Alloy 52/52M/52MS material is consistent with weld filler material used to perform similar weld overlays at operating pressurized water reactor facilities and that the licensee is performing a full structural overlay on dissimilar metal welds made of Alloy 182 material. For material compatibility in welding, the NRC staff considers Alloy 52/52M/52MS a better choice of filler material than austenitic stainless steel material for this weld joint configuration. Alloy 52/52M/52MS contains about 28 to 30 percent chromium which would provide excellent resistance to PWSCC in the reactor coolant environment. This material is identified as F-No. 43 Grouping for Ni-Cr-Fe, classification UNS N06052 Filler Metal and has been previously approved by the NRC staff for similar applications. Therefore, the licensee's proposed use of Alloy 52/52M/52MS for the weld overlays as a modification to the requirements of N-504-2, paragraph (b) is authorized as it will provide an acceptable level of quality and safety.

The second proposed modification to the N-504-2 provisions involved paragraph (e) of N-504-2 which requires as-deposited delta ferrite measurements of at least 7.5 Ferrite Number (FN) for the weld reinforcement. The licensee proposed that delta ferrite measurements will not be performed for this overlay because the deposited Alloy 52/52M/52MS material is 100-percent austenitic and contains no delta ferrite due to the high nickel composition (approximately

60-percent nickel). N-504-2 allows the use of weld overlay repair by deposition of weld reinforcement on the outside surface of the pipe in lieu of mechanically reducing the defect to an acceptable flaw size. However, N-504-2 is only applicable to weld overlay repair of austenitic stainless steel piping. Therefore, the material requirements regarding the carbon content limitation (0.035% maximum) and the delta ferrite content of at least 7.5 FN, as delineated in N-504-2, paragraph (e), apply to austenitic stainless steel weld overlay materials. These requirements are not applicable to Alloy 52/52M/52MS, a nickel-based material which the licensee will use for the weld overlays. Based on the discussion above, the NRC staff concludes that the modification to paragraph (e) of N-504-2 will provide an acceptable level of quality and safety, and is, therefore, authorized.

The third modification requested by the licensee is to use a system leakage test versus a system hydrostatic test in accordance with ASME Code, Section XI, IWA-4540(a)(2). A system leakage test in accordance with IWA-5000 is allowed provided the requirement under IWA-4540(a)(2)(a) is met, which requires NDE acceptance criteria of the 1992 edition or later of Section III be met prior to return to service. The licensee's proposed modification of performing a system leakage test versus a hydrostatic test is supported by the NRC staff's position with respect to Code Case N-416-3. The NRC staff notes that Code Case N-416-3, "Alternative Pressure Test Requirement for Welded or Brazed Repairs, Fabrication Welds or Brazed Joints for Replacement Parts and Piping Subassemblies, or Installation of Replacement Items by Welding or Brazing, Classes 1, 2, and 3, Section XI, Division 1 (N-416-3)," was unconditionally approved for use in RG 1.147, Revision 14. N-416-3 states that ".....a system leakage test may be used provided the following requirements are met:" Paragraph (a) states: "NDE shall be performed on weld or brazed repairs and fabrication and installation joints in accordance with the methods and acceptance criteria of the applicable subsection of the 1992 Edition of Section III." The acceptance criteria in Section III do not allow the presence of cracks, regardless of length, and is geared more towards construction-type welds.

The licensee's modification, which is a system pressure test with the use of the post-repair NDE requirements of N-504-2 and Appendix Q, utilizing the appropriate Performance Demonstration Initiative (PDI) procedures, as discussed later in this safety evaluation, is acceptable. The post-repair examination volume includes the full thickness of the weld overlay plus 25 percent of the underlying base metal thickness. The specimen sets for PDI qualification for weld overlay examinations include construction type flaws. Use of PDI qualified personnel and procedures for the examination of the weld overlay will result in the reliable detection of construction type flaws and meets the intent of compliance with the applicable subsection of the 1992 edition of Section III, and, therefore, provides an acceptable level of quality and safety.

Based on the discussion above, the NRC staff concludes that the modifications to N-504-2 will provide an acceptable level of quality and safety, and are, therefore, authorized.

3.5 Licensee's Proposed Modifications to N-638-1

The licensee proposed to use N-638-1 as an alternative to the mandatory ASME Code repair provisions with the following modifications for full structural weld overlays:

- The maximum area of an individual weld based on the finished surface over the ferritic material will be approximately 125 in^2.

- Full ultrasonic testing (UT) of the 1.5T band on the ferritic side of the overlay(s) will not be performed. UT will be performed on the actual weld overlay, meeting the requirements of ASME Code, Section XI, Nonmandatory Appendix Q.

- In lieu of weld-attached thermocouples and recording instruments, process temperatures will be monitored with non-attached devices, such as contact pyrometers.

3.6 Licensee's Basis for Relief

For the first modification, the licensee stated that the one-half base metal thickness limitation, which also includes the 100 in^2 surface area limitation under 1.0(a) of N-638-1, applies only to excavations and repairs, and is not applicable to the weld overlays that are the subject of this relief request. Therefore, the 100-in^2 surface area limitation is not applicable to this configuration. There have been a number of temper bead weld overlay repairs applied to safe-end to nozzle welds in the nuclear industry and a similar 300-in^2 full structural weld overlay was recently approved for the Susquehanna Steam Electric Station. The licensee also stated in its September 11, 2006, letter that weld shrinkage caused by application of the overlays will be measured and evaluated for any system impacts, as required by N-504-2, paragraph (g)(3) prior to returning the system to service.

For the second modification, the licensee stated that in lieu of the requirement to perform an ultrasonic examination of the 1.5T band next to the overlay, the post overlay non-destructive examinations will be performed in accordance with the requirements of N-504-2. The licensee stated that N-638-1 applies to any type of welding where a temper bead technique is to be employed and is not specifically written for a weld overlay repair. The licensee stated that if the cracking were to occur, it would be beneath the weld overlay instead of the 1.5T area that is not covered by the overlay.

For the third modification, the licensee stated that temperatures will be monitored with non-attached devices and the instruments used will be calibrated in accordance with approved calibration and control program requirements.

3.7 NRC Staff's Evaluation of Modification to N-638-1

N-638-1 limits the size of the repair to a maximum of 100 in^2 and a depth not greater than ½ the ferritic base metal thickness or 3/8". Some of the reasons for these limits are distortion of weld and base metal, cracking in the weld and base metal, and high residual stresses when a large repair excavation is being performed in the ferritic material of a dissimilar metal weld. In the application of the preemptive weld overlay for this relief request, there is no large excavation in the ferritic portion of the material, therefore, relaxation of the 100-in^2 limitation does not significantly contribute to cracking when the ferritic material is overlaid rather than excavated.

Based on the information provided by the licensee and the discussion above, the NRC staff concludes that the maximum overlay deposit of 125 in^2 will provide reasonable assurance of the structural integrity of the weld, and is acceptable.

The second modification requested by the licensee is that full UT of the 1.5T band required under paragraph 4.0(b) will not be performed. The NRC staff notes that the post weld overlay examination area, as defined under Appendix Q, is ½ inch on either side of the overlay for

surface examination and the completed overlay for ultrasonic examination. Appendix Q is a condition to the use of N-504-2, imposed by the NRC staff under RG 1.147, Revision 14, with which the licensee specifically states that it will comply in its August 24, 2006, letter. The issue of cracking and/or distortion of the weld and base metal were not specifically addressed in the code case development work. Since the weld overlays are fabricated from austenitic materials with inherent toughness, no cracking in the overlays is expected to occur due to the shrinkage associated with the weld overlay. With respect to the ferritic portion of the overlays, many temper bead weld overlays have been applied in the nuclear industry to nozzle-to-safe end locations. In no instance has there been any reported cracking due to the weld overlay application. The stiffness and high toughness inherent in the low alloy steel material is expected to protect against any cracking and limit any distortion that might occur in the low alloy steel material.

In its supplemental letter dated September 11, 2006, the licensee stated that it will be measuring and evaluating axial shrinkage for impact on the materials and on the piping system after the weld overlay is deposited, which is in accordance with the requirements of N-504-2(g)(2) and (g)(3). Also, any cracking which might occur should be detected by the final NDE of the weld overlay required under Appendix Q, which provides additional assurance of the deposition of a defect-free, structurally sound overlay. The assessment of the shrinkage stresses on the piping, plus post-weld nondestructive examination volumes under Appendix Q, provide reasonable assurance that defect-free welds will result in maintaining the structural integrity of the piping. The NRC staff concludes that the testing under Appendix Q will provide an acceptable level of quality and safety, therefore, the NRC staff finds the proposed modification to the 1.5T band ultrasonic examination requirement under N-638-1 acceptable.

The third modification requested by the licensee is to manually record process temperatures using calibrated instruments such as contact pyrometers. Paragraph 4.0(c) of N-638-1 states that when weld-attached thermocouples and recording instruments are used, the area from which the thermocouples have been removed will be ground and examined using a surface examination. Published literature clearly identifies grinding as a method of cold working which acts as a crack initiation site for PWSCC sensitive materials. The opportunity to reduce the amount of cold work in these materials is considered an effective tool to prevent cracking. The licensee's modification to monitor process temperatures with contact instrumentation that eliminates welding and grinding is considered a good practice and an effective remedy to minimize cold work. Based on the discussion above, the staff concludes that the modification to monitor process temperatures with calibrated contact temperature monitoring devices will provide an acceptable level of quality and safety, and, therefore, is acceptable.

In its supplemental letter dated October 5, 2006, the licensee provided additional justification for using the NDE acceptance criteria under N-504-2 and Appendix Q versus the Construction Code criteria designated as a condition to use N-638-1 under RG 1.147, Rev. 14. The licensee states that the acceptance criteria of ASME Code, Section XI, Code Case N-504-2 and Nonmandatory Appendix Q in lieu of those of NB-5330 of ASME Code, Section III will be used.

ASME Code, Section III, flaw acceptance standards are derived from the capability of radiography to detect and size flaws originating from the fabrication process used during new facility construction. The ASME Code, Section III acceptance criteria do not allow for the presence of any cracks or crack-like indications, regardless of their size, and are geared more

towards volumetric flaws. The capability of radiography is a function of density differences such as 2 percent or greater changes in density. The density changes normally associated with cracks, depending on orientation, are much less than the detection capability of radiography. There is an inherent, unknown tolerance in the ASME Code, Section III acceptance criteria for radiography which encompasses tight cracks and densities below the detection capabilities of radiography. Flaws detected using radiography are not precise enough for applying ASME Code, Section XI crack growth analyses, as flaw depth cannot be measured with radiography. ASME Code, Section III radiography is not applicable for evaluating flaws for continued plant operations because of the difficulty associated with depth-sizing flaws.

The weld overlays in this request are to mitigate PWSCC in dissimilar metal welds at Oconee Units 1, 2, and 3. The application of Code Case N-504-2 is for applying austenitic (Alloy 52/52M) weld material on austenitic base material. The application of N-638-1 would apply austenitic weld metal on ferritic base material using a controlled heat input that relieves welding stresses and prevents crack-sensitive microstructures in the ferritic material. The purpose of N-638-1 is to establish an austenitic surface for the application of N-504-2 to complete the structural weld overlay. The N-638-1 applied weld metal is sandwiched between base metal and N-504-2 weld metal. Locating a flaw in N-638-1 weld metal using ASME Code Section III radiography would be extremely difficult.

Many flaws that are not detected or accurately sized with radiography have a high likelihood of being detected and sized with UT, depending on orientation. These flaws are normally detected with UT during the ASME Code, Section XI pre-service inspection. Also, the pre-service UT is used to characterize flaws detected during the ASME Code, Section III radiography examination. The flaws of concern are the ones that cause failure immediately or grow to failure in the future. The ASME Code, Section XI pre-service acceptable flaw standards were developed to consider the materials in which the flaw indications are detected, the orientation and size of the indications, and ultimately the potential structural impact of the flaw on the component. The flaws detected during pre-service inspections are subjected to periodic inservice inspections as established in Appendix Q, Q-4300. This includes inspection frequencies for monitoring existing crack growth and identifying new cracks. Thus, the established pre-service NDE acceptance criteria in Code Case N-504-2/Appendix Q for weld overlays made with Alloy 52/52M/52MS weld metal should also be applied to the portion of the weld overlay made during the application of N-638-1 so that an adequate level of safety and quality will be maintained.

In its supplemental letters dated August 24 and October 5, 2006, the licensee committed to submitting the results of the post overlay NDE to the staff within 2 weeks of the completion of the overlay. Another commitment was made to submit to the NRC staff, prior to entry into operational Mode 4 for Oconee Unit 1, a summary of the results of the stress analyses demonstrating that the preemptive full structural weld overlays will not hinder the components from performing their design function.

In its March 12, 2007, submittal, the licensee modified its commitment to eliminate the submittal of the analyses prior to operational Mode 4 for Oconee Units 2 and 3. The basis for this modification is that the analysis for Unit 1 is bounding for Units 2 and 3 due to similarity in design and size of the overlays. The NRC staff finds this modification acceptable. Based on

the discussion above, the NRC staff finds that the proposed alternative to the mandatory ASME Code repair provisions, which includes modifications to N-504-2 and N-638-1, will provide an acceptable level of quality and safety, and are, therefore, acceptable.

3.8 ASME Code, Section XI Requirements for which Relief is Requested

Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee requested relief from the weld overlay examination qualification requirements in the following nine paragraphs to Section XI, Appendix VIII, Supplement 11. Only those items considered by the NRC staff to be alternatives to Appendix VIII, Supplement 11, are listed:

1. Paragraph 1.1(b) limits the maximum thickness for which a procedure may be qualified. Also, 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.

2. Paragraph 1.1(d)(1) requires that all base metal flaws be cracks in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75 percent through the base metal wall.

3. Paragraph 1.1(e)(1) requires that at least 20 percent but not less than 40 percent of the flaws shall be oriented within ±20 degrees of the axial direction.

4. Paragraph 1.1(e)(1) also requires that the rules of IWA-3300 be used to determine whether closely spaced flaws should be treated as single or multiple flaws. Specimens are divided into base and overlay grading units with each specimen containing one or both types of grading units.

5. Paragraph 1.1(e)(2)(a)(1) requires that a base grading unit include at least 3 inches of the length of the overlaid weld and the outer 25 percent of the overlaid weld and base metal on both sides.

6. Paragraph 1.1(e)(2)(a)(3) requires that for unflawed base grading units, at least 1 inch of unflawed overlaid weld and base metal exist on either side of the base grading unit.

7. Paragraph 1.1(e)(2)(b)(1) requires that an overlay grading unit include the overlay material and the base metal-to-overlay interface of at least 6 in^2. The overlay grading unit shall be rectangular, with minimum dimensions of 2 inches.

8. Paragraph 3.1 requires that examination procedures, equipment, and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VII-S2-1 for both detection and false calls. The criteria shall be satisfied separately by the demonstration results for base grading units and for overlay grading units.
9. Paragraph 3.2(b) requires that all extensions of base metal cracking into the overlay material by at least 0.1 inch are reported as being intrusions into the overlay material.

3.9 Licensee's Proposed Alternative to Appendix VIII, Supplement 11

In lieu of the requirements of the ASME Code, Section XI, Appendix VIII, Supplement 11, the licensee proposed that the Performance Demonstration Initiative (PDI) program as described in its application and supplemental information be used.

3.10 Licensee's Basis for Relief

The licensee stated that the UT examination of the completed preemptive weld overlays will be accomplished in accordance with ASME Code, Section XI, 1998 edition with the 2000 addenda, Appendix VIII, Supplement 11 with the modifications described in its application. These modifications were developed by the EPRI PDI program to implement the requirements of Appendix VIII and have been previously approved by the NRC staff. The licensee stated that the proposed alternative, which includes these modifications, provides an acceptable level of quality and safety.

3.11 NRC Staff's Evaluation of Proposed Alternative to Appendix VIII, Supplement 11

The U.S. nuclear utilities, in junction with EPRI, created the PDI program to implement the performance demonstration requirements contained in Appendix VIII of Section XI of the ASME Code. To this end, the 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 maintained a performance demonstration program for weld overlay qualification under the Tri-party Agreement. (The Tri-party Agreement is between NRC, EPRI, and the Boiling Water Reactor Owners Group (BWROG), "Coordination Plan for NRC/EPRI/BWROG Training and Qualification Activities of NDE (Nondestructive Examination) Personnel," 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 (Letter from William H. Bateman to Michael Bratton, "Weld Overlay Performance Demonstration Administered by PDI as an Alternative for Generic Letter 88-01 Recommendations," January 15, 2002 (ADAMS Accession No. ML020160532)).

The PDI program is assessed by the NRC staff during semi-annual public meetings for consistency with the current ASME Code and proposed changes. The PDI program does not fully comport with the existing requirements of Supplement 11. The PDI presented the differences at public meetings in which the NRC participated (Memorandum from Donald G. Naujock to Terence Chan, "Summary of Public Meeting Held January 31 - February 2, 2002, with PDI Representatives," March 22, 2002 (ADAMS Accession No. ML010940402) and Memorandum from Donald G. Naujock to Terence Chan, "Summary of Public Meeting Held June 12 through June 14, 2001, with PDI Representatives," November 29, 2001 (ADAMS Accession No. ML013330156)). The differences are in flaw location within test specimens and fabricated flaw tolerances.

Based on the evaluation of the differences in the PDI program to the requirements in Supplement 11, the NRC staff finds that the differences to Supplement 11 are acceptable and provide an acceptable level of quality and safety. Therefore, the NRC staff concludes that the proposed alternative to the Appendix VIII, Supplement 11, of the 1998 Edition through 2000 Addenda of the ASME Code, Section XI, is acceptable.

4.0 CONCLUSION

Based on the discussion above, the NRC staff concludes that the Code Case N-504-2 and N-638-1 modifications proposed in RR No. 06-ON-004 for Unit 1 and RR No. 07-ON-001 for Units 2 and 3 , for the preemptive full structural overlays of the welds discussed in the August 24, 2006, letter and supplements dated September 11, October 5, October 26, and November 27, 2006, and March 12, 2007, will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff authorizes the proposed alternatives, which include the modifications to N-504-2 and N-638-1, for the remaining service life of the pressurizer surge nozzle weld overlay, hotleg surge nozzle weld overlay, pressurizer spray nozzle weld overlay, and pressurizer safety relief nozzle weld overlay.

Secondly, based on the discussion above, the NRC staff concludes that the alternatives to ASME Code, Appendix VIII, Supplement 11, will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff authorizes the proposed alternatives for the remainder of the third 10-year ISI interval at ONS Units 1, 2, and 3.

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

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