

May 19, 2008

Mr. Timothy J. O'Connor
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SUBJECT: MONTICELLO NUCLEAR GENERATING PLANT (MNGP) – GRANTING OF
RELIEF REGARDING LIMITED ULTRASONIC EXAMINATION COVERAGE OF
FIVE WELDS (TAC NO. MD6854)

Dear Mr. O'Connor:

By letter dated September 26, 2007, as supplemented by letter dated March 21, 2008, Nuclear Management Company (NMC) submitted Relief Request No. 15, seeking relief from the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code to allow limited ultrasonic test examination coverage at MNGP. Relief Request No. 15 is applicable to a total of five welds in the nozzles of the recirculation inlet, feedwater inlet, reactor head spare, and control rod drive return lines.

The Nuclear Regulatory Commission staff completed its review of NMC's request and has documented details of its review in the enclosed safety evaluation. Pursuant to 10 CFR 50.55a(g)(6)(i), relief is granted in accordance with Relief Request No. 15 for the fourth 10-year inservice inspection interval. The granting of this relief 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 NMC that could result if the requirements were imposed on the facility.

If you have any questions, please call the Project Manager, Mr. Peter Tam at 301-415-1451.

Sincerely,

/RA/

Lois M. James, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-263

Enclosure:
Safety Evaluation

cc w/encl: See next page

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DATE	4/22/08	4/21/08	4/10/08	5/13/08	5/19/08

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*Safety evaluation transmitted by memo of 4/10/08.

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELIEF REQUEST NO. 15 FROM 10 CFR 50.55a REQUIREMENTS
EXAMINATION COVERAGE OF REACTOR VESSEL NOZZLE WELDS
NUCLEAR MANAGEMENT COMPANY
MONTICELLO NUCLEAR GENERATING PLANT (MNGP)
DOCKET NO. 50-263

1.0 INTRODUCTION

By letter dated September 26, 2007 (Agencywide Document Access and Management System (ADAMS) Accession No. ML072710119), as supplemented by letter dated March 21, 2008 (ADAMS Accession No. ML080810233), Nuclear Management Company (NMC, the licensee) submitted Relief Request No. 15, seeking relief from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code to allow limited ultrasonic test (UT) examination coverage at MNGP. Inservice inspection (ISI) Relief Request No.15 is applicable to a total of five welds in the nozzles of the recirculation inlet, feedwater inlet, reactor head spare, and control rod drive return lines.

2.0 REGULATORY EVALUATION

Pursuant to Title 10, *Code of Federal Regulations* (10 CFR), paragraph 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 pre-service 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.

Pursuant to 10 CFR 50.55a(g)(5)(iii), if the licensee determines that conformance with an examination requirement of Section XI of the ASME Code is impractical for its facility, the licensee shall notify the Commission and submit information to support the determination. After evaluation of the determination, pursuant to 10 CFR 50.55a(g)(6)(i), the Commission may grant relief and may impose alternative requirements that are determined to be authorized by law, will not endanger life, property, or the common defense and security, and are otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed.

Paragraph 10 CFR 50.55a(a)(3) states, in part, that alternatives to the requirements of paragraph (g) may be used, when authorized by the Nuclear Regulatory Commission (NRC), if the licensee demonstrates that: (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 in-service examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The code of record for the current, fourth 10-year ISI interval at MNGP is the 1995 Edition with the 1996 Addenda of the ASME Code, Section XI.

3.0 TECHNICAL EVALUATION

The NRC staff's technical evaluation of the licensee's ISI Relief Request No. 15 follows.

3.1 ASME Code Components Affected

Components affected are ASME Code, Section XI, Class 1, reactor vessel nozzle-to-vessel welds as specified below:

Recirculation Inlet	Nozzle N-2B	Weld - N-2B NV
Recirculation Inlet	Nozzle N-2G	Weld - N-2G NV
Feedwater Inlet	Nozzle N-4A	Weld - N-4A NV
Reactor Head Spare	Nozzle N-6A	Weld - N-6A NV
Capped Control Rod Drive (CRD) Return	Nozzle N-9	Weld - N-9 NV

3.2. Applicable ASME Section XI Code Edition and Addenda

The applicable ASME Section XI Code for MNGP, fourth 10-year ISI interval is the 1995 Edition with the 1996 Addenda.

3.3 Applicable Code Requirement

ASME Class 1 nozzle-to-vessel welds are subject to the examination requirements of Subsection IWB Table IWB-2500-1, as shown below, and 10 CFR 50.55a(b)(2)(xv)(G). The welds are required to be examined once within the fourth 10-year interval:

Code Class:	1
References:	IWB-2500, Table IWB-2500-1, of the ASME Code, Section XI
Examination Category:	B-D
Item Number:	B3.90
Description:	Nozzle-to-Vessel Welds
Component Numbers:	See Above
System:	Reactor Vessel
Examination Method:	Volumetric - UT
Examination Volume:	Figure IWB-2500-7(b) of the ASME Code, Section XI

In August 2005, the NRC issued Regulatory Guide (RG) 1.147, Revision 14, ISI Code Case Acceptability, ASME Section XI, Division 1. In RG 1.147, the NRC identified the ASME Code Cases that are acceptable alternatives to applicable parts of Section XI, and stated that these Code Cases may be used without requesting authorization from the NRC provided that they are used with associated limitations or conditions specified in the RG. RG 1.147, Table 1 lists the following two Code Cases as acceptable to the NRC for use by a licensee with no identified limitations or modifications: (1) Code Case N-460, and (2) Code Case N-613-1.

Code Case N-460 states in part, "when the entire examination volume or area cannot be examined due to interference by another component or part geometry, a reduction in examination coverage on any Class 1 or Class 2 weld may be accepted provided the reduction in coverage for that weld is less than 10 percent."

NRC Information Notice (IN) 98-42 termed a reduction in coverage of less than 10 percent to be "essentially 100 percent." IN 98-42 states, in part, "[t]he NRC has adopted and further refined the definition of 'essentially 100 percent' to mean 'greater than 90 percent' ... has been applied to all examinations of welds or other areas required by ASME Section XI."

Code Case N-613-1 provides an alternative examination volume that includes the width of the weld plus ½ inch of adjacent base metal on each side of the widest part of the weld. In comparison, the examination volume required by Figure IWB-2500-7(b) includes the width of the weld plus the adjacent base metal on each side of the widest part of the weld equal to ½ of the vessel shell wall thickness.

3.4 Impracticality of Compliance

Construction Permit CPPR-31 was issued to MNGP in 1967. The MNGP systems and components were designed and fabricated before the examination requirements of ASME Section XI were formalized and published. Therefore, MNGP was not specifically designed to meet the requirements of ASME Section XI, and full compliance is not feasible or practical within the limits of the current plant design. The regulations found at 10 CFR 50.55a recognize the limitations to ISI components in accordance with Section XI of the ASME Code that are imposed due to plants' early design and construction:

10 CFR 50.55a(g)(1): For a boiling or pressurized water-cooled nuclear power facility whose construction permit was issued prior to January 1, 1971, components (including supports) must meet the requirements of paragraphs (g)(4) and (5) of this section to the extent practical.

10 CFR 50.55a(g)(4): Throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) which are classified as ASME Code Class 1, Class 2, and Class 3 must meet the requirements, except design and access provisions and pre-service examination requirements, set forth in Section XI of editions of the ASME Boiler and Pressure Vessel Code.....to the extent practical within the limitations of design, geometry and materials of construction of the components.

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

The inspection limitations on the subject components are due to inherent nozzle design geometric contours. NMC provided a description of the examination methodology used to provide the maximum obtainable coverage. This methodology is based on ASME Section XI, Appendix VIII qualification, and was applied to the extent practical within the design constraints of the components. Enclosure 3 of the licensee's September 26, 2007, letter provides cross-sectional diagrams of the subject welds showing the geometric contour of the component

design in relation to the welds and the coverage obtained within the examination volume requirements of Code Case N-613-1, Figure 2.

The licensee stated that compliance with the examination coverage requirements of the ASME Code, Section XI, would require modification, redesign, or replacement of components where geometry is inherent to the component design.

3.5 The Licensee's Proposed Alternative and Basis

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief for the components listed above on the basis that the required examination coverage of "essentially 100 percent" is impractical due to physical obstructions and the limitations imposed by design, geometry and materials of construction."

The licensee performed qualified examinations that achieved the maximum, practical amount of coverage obtainable within the limitations imposed by the design of the components. Additionally, as Class 1 examination Category B-P components, the licensee performs a VT-2 examination on the subject components of the reactor coolant pressure boundary during system pressure tests each refueling outage. This was completed during the 2007 refueling outage and no evidence of leakage was identified for these components.

Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the requirements of ASME Section XI Table IWB-2500-1, Category B-D, Item B3.90, and proposed to use these completed exams as acceptable alternatives that provide reasonable assurance of continued structural integrity.

3.6 Duration of the Proposed Request

NMC requested the granting of this relief for the fourth 10-year ISI interval of the MNGP ISI program that is scheduled to end on May 31, 2012.

3.7 NRC Staff Evaluation

The licensee achieved the following percentages of examination volume coverage for the subject five welds during the 2007 refueling outage inspection.

Component	Nozzle number	Weld number	Exam coverage %
RPV Recirc inlet	N-2B	N-2B NV	78
RPV Recirc inlet	N-2G	N-2G NV	78
RPV Feedwater inlet	N-4A	N-4A NV	79
RPV Top Head Spare	N-6A	N-6A NV	86
RPV CRD Return Nozzle	N-9	N-9 NV	85

The licensee's nondestructive examination procedures incorporate inspection techniques qualified under Appendix VIII of the ASME Code, Section XI, by the Performance Demonstration Initiative (PDI) for examination of the subject nozzle-to-vessel welds, and allow the examination volume to meet the provisions of alternative requirements (i.e., Code Case N-613-1). In the March 21, 2008, letter, the licensee stated that the PDI Program meets the requirements of 10 CFR 50.55a up through the 2001 Edition of Section XI. The ASME Code, Section X, from the 1999 edition through the 2001 edition has been incorporated by reference in 10 CFR 50.55a.

The NRC staff finds that the licensee's PDI inspection is consistent with the PDI inspection requirements of 10 CFR 50.55a and, therefore, is acceptable.

During the 2007 refueling outage, the licensee performed UT examinations using a manual contact method from the nozzle outside blend radius and vessel surfaces. The licensee obtained coverage by following the scan parameters designated within its NDE procedures.

The scans defined by the Electric Power Research Institute (EPRI) reports are only applicable to the inner 15 percent of the weld volume when scanning in the parallel direction. The refracted longitudinal wave mode of propagation was applied for all the radial scans of the examination volume, and to the outer 85 percent of the examination volume for parallel scans. The shear wave mode of propagation was applied for each of the transducer and wedge combinations required for the remaining inner 15 percent of the parallel scan examination volume. The subject components received the required examination(s) to the extent practical within the limited access of the component design. One hundred percent coverage was achieved for the inner 15 percent of the examination volume. The examination limitations for the subject components were encountered within the outer 85 percent of the examination volume. For the examinations conducted, satisfactory results were achieved, and no evidence of unacceptable flaws was detected with the inspection techniques.

The licensee stated that due to the design of these welds it was not feasible to effectively perform a volumetric examination of "essentially 100 percent" of the required volume. The nozzle-to-vessel welds are accessible from the vessel plate side of the weld and are examined to the extent practical, but there are no qualified examinations to obtain coverage of the excluded areas within the outer 85 percent of the examination volume due to the nozzle forging curvature.

The licensee stated further that additional coverage for the limited areas was not achievable or practical, based on the latest qualified ultrasonic technology, nor by other considered examinations methods, such as radiography. The licensee has concluded that if significant degradation existed in the subject welds, it would have been identified by the examinations performed.

Additionally, as Class 1 examination category B-P components, the licensee performed VT-2 examinations on the subject components in association with the reactor coolant pressure boundary system pressure test performed during the 2007 refueling outage. The licensee did not identify leakage during this system test.

The materials for the subject components are A508, Class II, nozzle forgings welded to A533, Class I, vessel shell plate. In the March 21, 2008, letter, the licensee stated that the weld filler material for the subject joint was E8018NM. Inner diameter cladding materials are E309-15 for the base layer, and R308L or E308L-15 for subsequent layers. There are no pipe, safe end, or butter materials applicable to the nozzle-to-vessel shell welds. The licensee reviewed operating experience within the nuclear industry and did not find any instances of cracking in this location and type of weldment. The MNGP reactor vessel water chemistry is controlled in accordance with the 2004 revision to the BWR Water Chemistry Guidelines (Topical Report BWRVIP-130, "BWR Water Chemistry Guidelines - 2004 Revision 1" (EPRI Topical Report TR-1008192)).

A hydrogen water chemistry system is used to reduce the oxidizing environment in the reactor coolant. These additional measures provide added assurance to minimize the initiation of cracking or corrosion from the inside surface of the reactor vessel. An inerted primary containment environment during operation provides assurance of corrosion protection on the outside surface of the reactor vessel.

The NRC staff asked the licensee to discuss the history of volumetric examinations of the subject welds, including information on specific year and specific ISI interval, inspection results, and examination coverage (see publicly available e-mail, dated December 13, 2007, at ADAMS Accession No. ML073480419). Also, the NRC staff asked the licensee to discuss whether relief was requested for the examination coverage of the subject welds in the previous 10-year ISI intervals. In the March 21, 2008, letter, the licensee responded that per 10 CFR 50.55a(g)(1) and (4), each of the subject welds were examined to the extent practical during the first, second and third 10-year ISI intervals. However, prior to 1997, the licensee did not perform examination coverage determinations or submit relief requests pursuant to 10 CFR 50.55a(g)(5) for limited examinations. The licensee stated that it misinterpreted 10 CFR 50.55a(g)(4) which states that "[t]hroughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supportfs) which are classified as ASME Code Class I, Class 2 and Class 3 must meet the requirements, except design and access provisions and preservice examination requirements, set forth in Section XI. .to the extent practical within the limitations of design, geometry and materials of construction of the components."

The licensee interpreted the above paragraph to mean that interferences inherent in the design constituted impracticality, and were therefore exempted. When the misinterpretation was realized (during the third 10-year ISI interval), the licensee reported the lack of limited examination relief requests to the NRC by Licensee Event Report (LER) 97-004, "Failure to Submit Relief Requests for Limited Inservice Inspection Examinations" (ADAMS Legacy Library, Accession No. 9704010579). This was reported pursuant to 10 CFR 50.73(a)(2)(i)(B)(2) since, at that time, MNGP Technical Specification 3.15.A.1 contained the ISI program. In 1997, the failure to submit relief requests for examinations with inspection limitations constituted a noncompliance with Technical Specification 3.15.A.1.

The licensee performed corrective actions including a review of all third 10-year ISI interval examinations to determine limitations. Corrective actions indicate that limited examinations discovered during this review would be submitted to the NRC in a subsequent relief request. Although a review was completed, only the limited examinations going forward from 1998 were submitted in a relief request to the NRC.

The third 10-year ISI interval ended on May 31, 2003. Pursuant to 10 CFR 50.55a(g)(5)(iv), relief requests for limited examinations from the third 10-year interval should have been submitted and approved by May 31, 2004. Therefore, there was no means of regaining compliance with the third 10-year ISI interval, and retroactive 10 CFR 50.55a requests for the third 10-year ISI interval examination was thus not submitted to the NRC. This issue has been entered into the licensee's corrective action program.

The licensee has taken corrective action to prevent recurrence of the issues described in LER 97-004. Actions taken include creation of procedures to determine code coverage for limited examinations and to submit relief requests for impractical Code requirements pursuant to 10 CFR 50.55a(g)(5)(iv) when examination coverage is limited and Code examination requirements cannot be met.

The NRC staff asked the licensee to explain how the percentages of examination coverage of the subject welds were derived. In the March 21, 2008, letter, the licensee responded that the method used to determine coverage is based on field measurements applied to a two-dimensional plot. This technique allows an informed approximation to be made of the coverage achieved. The NRC staff agrees that this is appropriate to the application in that the limitations are physical and the methods applied to the examination are established by the qualified techniques. Variations in the percent coverage obtained in previous examinations are the result of changes in examination technique and/or required coverage. The current coverage determinations are different from past examinations due to the use of PDI-qualified techniques and a reduced volume obtained by use of Code Case N-613-1.

The coverage drawings included in Enclosure 3 of the licensee's September 26, 2007, letter, include a representation of the examination volume and the weld interface line in the same manner as the figure included in Code Case N-613-1. The area of coverage is identified by the shaded or cross-hatched areas on the drawings, while the remaining areas with no shading or cross-hatching indicate no coverage. The coverage drawings indicate the nozzle side of the weld by the location of the blend radius. The area on the opposite side of the weld from the nozzle represents the reactor vessel shell. Though there is variation, most of the limited coverage is in the nozzle base material with a lesser amount in the weld and base material on the vessel shell side. The licensee provided a worksheet from weld N-2B NV as Enclosure 2 of the March 21, 2008, letter. Pipe, safe-end, and butter material are not applicable to the subject welds included in Relief Request No. 15. The NRC staff finds that the licensee has clarified how the percentage of examination volume is calculated, and is satisfied with the licensee's calculations.

In Section 3.3 of this safety evaluation, the NRC staff stated that the licensee referenced RG 1.147, Revision 14, and associated Code Cases N-460 and N-613-1. RG 1.147, Revision 14 was the correct revision at the time of the licensee's submittal. The NRC staff notes that RG 1.147, Revision 15, has been issued since the licensee's October 2007 (ADAMS Accession No. ML072070419). The NRC staff's approval of the two code cases has not changed between Revisions 14 and 15. Therefore, it is acceptable for the licensee to reference Revision 14 of RG 1.147.

4.0 CONCLUSION

The NRC staff reviewed the licensee's submittals for relief from the ASME Code requirement for achieving 100 percent volumetric coverage. The NRC staff concludes that compliance with this requirement is impractical due to the subject nozzles' configurations. The NRC staff also determined that compliance with the ASME Code requirement would require modification, redesign, or replacement of components where geometry is inherent to the component design.

The NRC staff finds that the examination coverage of the accessible weld volume, in combination of VT-2 examinations, on the subject components during system pressure testing each refueling outage will provide reasonable assurance that the structural integrity of the subject welds is maintained. Additionally, the licensee's primary system water chemistry program and inerted primary containment environment provide added measures of protection from potential degradation of the subject welds.

subject welds is maintained. Additionally, the licensee's primary system water chemistry program and inerted primary containment environment provide added measures of protection from potential degradation of the subject welds.

Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), relief is granted to MNGP in accordance with ISI Relief Request No. 15 for the fourth 10-year ISI interval. The granting of this relief 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.

All other requirements of the ASME Code, for which relief has not been specifically requested and approved remain applicable, including third party review by the Authorized Nuclear Inservice inspector.

Principal Reviewer: John Tsao

Dated: May 19, 2008

Monticello Nuclear Generating Plant

cc:

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