Mr. Thomas J. Palmisano
Site Vice President
Prairie Island Nuclear Generating Plant
Nuclear Management Company, LLC
1717 Wakonade Drive East
Welch, MN 55089

August 29, 2006

SUBJECT: PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2 - REQUEST FOR RELIEF NO. 21 FOR THE THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM (TAC NO. MC8433)

Dear Mr. Palmisano:

By letter dated September 8, 2005, as supplemented by letter dated June 6, 2006, Nuclear Management Company, LLC (the licensee) submitted a request for relief from certain requirements of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code), Section XI, for the third 10-year interval inservice inspection (ISI) program at Prairie Island Nuclear Generating Plant, Unit 2.

The Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's submittal and concludes that ASME Code examination coverage requirements are impractical for the subject welds listed in Items 1 through 4, 6 and 7 for Request for Relief No. 21, Revision 0. Furthermore, based on the coverages obtained, if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would be detected by the examinations that were performed, and the examinations performed provide reasonable assurance of structural integrity of the subject welds. Therefore, for Items 1 through 4, 6 and 7, relief is granted, pursuant to 10 CFR 50.55a(g)(6)(i), for the Prairie Island, Unit 2 third 10-year ISI inspection interval.

The NRC staff concludes that for the full penetration dissimilar metal nozzle-to-pipe weld W-5 on the inlet nozzle of Steam Generator 22, as described in Item 5 of Request for Relief No. 21, Revision 0, the licensee has failed to meet ASME Code requirements relative to the implementation of Performance Demonstration Initiative examination methods. Therefore, relief for Item 5 is denied for the Prairie Island, Unit 2 third 10-year ISI inspection interval.

The staff has determined that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) for Items 1, 2, 3, 4, 6, and 7 of Request for Relief No. 21, 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 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.

The detailed results of the NRC staff's review are enclosed in the safety evaluation. The enclosure includes a summary table of the relief requests and the status of approval for each one. If you have any questions concerning this matter, please call Mr. M. Chawla of my staff at (301) 415-8371.

Sincerely,

/RA/

Martin C. Murphy, Acting Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-306

Enclosure:
Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO REQUEST FOR RELIEF NO. 21

FOR THE THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM

NUCLEAR MANAGEMENT COMPANY, LLC

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2

DOCKET NO. 50-306

1.0 INTRODUCTION

The U.S. Nuclear Regulatory Commission (NRC) staff, with the assistance of Pacific Northwest National Laboratory (PNNL), has reviewed and evaluated the information provided by Nuclear Management Company, LLC (NMC, the licensee) in its submittal dated September 8, 2005 (ADAMS Accession No. ML052560277), as supplemented by letter dated June 6, 2006 (ADAMS Accession No. ML061580202), which proposed its Third 10-Year Interval Inservice Inspection Program Plan Request for Relief (RR) No. 21 for Prairie Island Nuclear Generating Plant, Unit 2 (Prairie Island, Unit 2). The staff adopts the evaluations and recommendations for granting or denying relief contained in PNNL's Technical Letter Report (ADAMS Accession No. ML062010232), which has been incorporated into this safety evaluation (SE). The summary table attached to this SE lists each RR and the status of approval.

2.0 REGULATORY REQUIREMENTS

Inservice inspection (ISI) of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code) Class 1, 2, and 3 components is performed in accordance with Section XI of the ASME Code and applicable addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g), except where specific relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). The regulation at 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if: (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that 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), 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The ASME Code of record for the Prairie Island, Unit 2 third 10-year interval ISI program, which began on December 21, 1994, and ended on December 20, 2005, is the 1989 Edition of Section XI of the ASME Code with no Addenda.

3.0 STAFF EVALUATION

The information provided by NMC in support of the RR from ASME Code requirements has been evaluated, and the basis for disposition is documented below. For clarity, RR 21, Revision 0 has been evaluated in several parts according to ASME Code Examination Category.

3.1 Request for Relief No. 21, Items 1 through 4, ASME Code, Section XI, Examination Category B-D, Item B3.90, Full Penetration Welded Nozzles in Vessels

ASME Code Requirement

ASME Code, Section XI, Examination Category B-D, Item B3.90 requires 100 percent volumetric examinations, as defined by Figures IWB-2500-7(a) through (d), as applicable, of the length of Class 1 full penetration nozzle-to-shell welds in the reactor pressure vessel (RPV). ASME Code Case N–460, *Alternative Examination Coverage for Class 1 and Class 2 Welds*, as an alternative approved for use by the NRC in Regulatory Guide No. 1.147, Revision 14, *Inservice Inspection Code Case Acceptability* (RG No. 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.

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100 percent of the ASME Code-required inspection volume(s) shown in ASME Code, Section XI, Figures IWB-2500-7(a) through (d), as applicable, for primary outlet nozzle-to-shell welds N–7 and N–10 and safety injection nozzle-to-shell welds N–8 and N–11 on the RPV.

Licensee's Basis for Relief Request (As Stated)

The reactor [pressure] vessel (RPV) [outlet] nozzle-to-vessel welds are subject to a volumetric examination. The volumetric examination was performed using personnel and procedures qualified in accordance with [ASME Code, Section XI,] Appendix VIII, Supplements 4, 6, and 7. The examination was conducted using a 45-degree transducers when examining the subject welds. The nozzles and vessel material are SA 508. The examinations were limited in both the parallel and perpendicular scans from the vessel [inside diameter] ID to 78.56 percent [of the required examination volume] due to the proximity of the outlet nozzle protrusion to the nozzle-to-shell weld. As an alternative to the ultrasonic examination, radiography was considered and determined to be an unacceptable substitute due to no outside access and [the] weld configuration.

The RPV [safety injection] nozzle-to-vessel welds are subject to a volumetric examination. The volumetric examination was performed using personnel and procedures qualified in accordance with [ASME Code, Section XI,] Appendix VIII, Supplements 4, 6, and 7. The examination was conducted using 45-degree transducers. The nozzles and vessel material are SA 508. The examinations were limited in both the parallel and perpendicular scans from the vessel ID to 59.26 percent [of the required examination volume] due to the proximity of the nozzle protrusion to the nozzle-to-shell weld. As an alternative to the UT examination, radiography was considered and determined [it] to be an unacceptable substitute due to no outside access and [the] weld configuration.

Licensee's Proposed Alternative Examination (As Stated)

All in-service inspections at Prairie Island Unit 2 have been completed to the greatest extent practical. When limitations to required inspections are encountered, Prairie Island's "Limitations to NDE [nondestructive examination]" procedure SWI NDE-LTS-1 was applied. SWI NDE-LTS-1 is used when an [ASME Code, Section XI] required examination results in less than 90 percent coverage. It requires a review of the procedures to obtain maximum coverage and documentation of the limitation. The procedure also examines whether an alternative method could be used to obtain better coverage as allowed by the Code. This procedure was used for all the items identified above and the maximum inspection coverage was achieved.

Limitations are due to design, geometry, and materials of construction of the components. NMC will continue to utilize the most current techniques available for future examinations.

The staff requested additional information for RR No. 21, Items 1 through 4 in its e-mail dated May 1, 2006 (ADAMS Accession No. ML061250419). The licensee responded to the staff's request in its letter dated June 6, 2006, as provided below:

Response to Request for Additional Information (As Stated)

The reactor coolant (RC) loop primary outlet nozzles have an extension of the vessel wall that mates to the core barrel (the protrusion). The transducer travel is extended on the vessel wall up to but not over the protrusion. The RC loop primary inlet nozzles do not have similar protrusions and the transducers are able to travel up to the nozzle inner radius. ASME Section XI, Figure IWB-2500-7(a), depicts a typical nozzle protrusion. Figure IWB-2500-7(b) depicts a typical inlet nozzle configuration.

The reason given for the limited coverage [on the safety injection nozzle] should have been described as the safety injection nozzle protrusion. The previous wording incorrectly characterized the limitation as the RC loop primary outlet nozzle. The safety injection nozzles have an extension of the vessel wall that mates to the core barrel (the protrusion). The transducer travel is extended on the vessel wall up to but not over the protrusion. ASME Section XI, Figure IWB-2500-7(a), depicts a typical nozzle protrusion. The weld volumes exhibited such limited coverages for the 45 shear (15.55 percent), 45 longitudinal single (0 percent), and 45 longitudinal dual (0 percent) transducers on the circumferential (tangential) scans (what NMC calls parallel scans) because of the safety injection nozzle protrusion. For the safety injection nozzle

protrusion, as typically seen on ASME Figure IWB-2500-7(a), the weld is adjacent to the nozzle protrusion, therefore the examination volume extends onto this protrusion area. Thus, the parallel scans are greatly reduced due to the physical limitations. Only 25.74 percent coverage is obtained in this direction. The perpendicular scans have a combined coverage of 92.78 percent for N8 and N11.

Staff Evaluation

The ASME Code requires that 100 percent volumetric examinations of the entire length of RPV nozzle-to-shell welds be performed during each inspection interval. However, the design of the primary outlet and safety injection nozzles at Prairie Island, Unit 2, restrict transducer placement in such a way that coverage is less than the full ASME Code-required examination coverages. In order to increase this coverage, the nozzles would have to be redesigned and modified. This would place a burden on the licensee, to the extent that the ASME Code volumetric coverage requirements are impractical.

The RPV primary outlet and safety injection nozzles at Prairie Island, Unit 2, are forged set-in, or barrel-type, designs that have protrusions extending beyond the cylinder of the RPV inside surface. This extension only allows scanning with the automated inspection device from the shell side of the subject welds. This is a problem for ultrasonic angle beam scans directed perpendicular and parallel to the required inspection volumes; however, the diameter and orientation of the primary outlet nozzle-to-vessel welds allow for perpendicular scans from the nozzle bore, thus augmenting volumetric coverage. The safety injection nozzles are too small in diameter to allow scans to be made from the nozzle bore.

As shown on the sketches and technical descriptions[1] provided by the licensee, aggregate volumetric coverage levels obtained were approximately 79 percent for RPV outlet nozzle welds N–7 and N–10 and 59 percent for safety injection nozzle welds N–8 and N–11. However, shell side examinations, combined with the augmented bore examinations, on the outlet nozzles included approximately 99 percent of the ASME Code-required inspection volumes. The licensee found no unacceptable flaws in any of the nozzle-to-vessel welds examinations.

The licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the subject nozzle-to-vessel welds due to the design of the nozzles. Based on the volumetric coverages obtained, along with the full examination of ASME Code-required volumes on other RPV pressure-retaining welds, the NRC staff concludes that if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would be detected by the examinations that were performed, and the examinations performed provide reasonable assurance of structural integrity of the subject welds.

1 Sketches and technical descriptions provided by the licensee are not included in this report.

3.2 Request for Relief No. 21, ASME Code, Section XI, Item 5, Examination Category B-F, Item B5.70, Pressure Retaining Dissimilar Metal Welds in Vessel Nozzles, Steam Generator

ASME Code Requirement

ASME Code, Section XI, Examination Category B-F, Item B5.70 requires 100 percent volumetric examination, as defined by Figure IWB-2500-8, of the length of Class 1 full penetration nozzle-to-safe end welds on the steam generator. 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, 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.

In addition, 10 CFR 50.55a(g)(6)(ii)(C) requires that licensees implement examination procedures, personnel, and equipment that have been qualified through performance demonstration to the requirements of the 1995 Edition, 1996 Addenda of the ASME Code, Section XI, Appendix VIII, Supplement 10 for all dissimilar metal full penetration welds examined after November 22, 2002.

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from performing 100 percent volumetric examination on dissimilar metal Weld W-5 on the primary inlet nozzle of Steam Generator 22.

Licensee's Basis for Relief Request (As Stated)

This dissimilar metal weld joint configuration is not currently covered by the demonstrated samples at the Electric Power Research Institute (EPRI) Performance Demonstration Initiative (PDI) center. Due to the design of the joint, no mockup could be created to examine this ultrasonically to meet [ASME Code, Section XI,] Appendix VIII, Supplement 10. Therefore, a supplemental ultrasonic (UT) exam was performed with the following results:

The Elbow-to-Safe End weld [was] subject to a volumetric examination and surface examination. The volumetric examination was performed using personnel and procedures qualified in accordance with [ASME Code, Section XI,] Appendix III. The examination was conducted using 45-degree refracted longitudinal transducers. The elbow and safe end material are SA 351-CF8 cast austenitic stainless and 308L stainless (this joint contains no Alloy 82/182 or 600). The examination was limited to 78.46 percent due to the OD [outside diameter] profile of the cast stainless steel elbow. The UT [ultrasonic] examination is further hindered from the elbow side of the weld for obtaining meaningful ultrasonic data because of the elbow material being cast austenitic stainless steel. UT sound beam attenuation and propagation properties in cast stainless steel are extremely difficult. The ASME Code Committee and the industry PDI recognized that such examinations are difficult. ASME Section XI, Appendix VIII,

Supplement 9 has been in "course of preparation" for several years, hence, there are no qualified examination procedures or personnel to conduct the required examinations. As an alternative to the UT examination, radiography was considered and determined to be an unacceptable substitute due to radiological constraints, the reactor vessel level would be required to be at reduced inventory below the center line of the hot leg, weld configuration, and the undue hardship imposed without offering any commensurate increase in safety with cost benefit.

The required surface examination was performed using liquid penetrant and was not limited. One hundred percent of the required surface area was inspected. No relevant indications were detected.

Licensee's Proposed Alternative Examination (As Stated)

All in-service inspections at Prairie Island, Unit 2 have been completed to the greatest extent practical. When limitations to required inspections are encountered, Prairie Island's "Limitations to NDE" procedure SWI NDE-LTS-1 was applied. SWI NDE-LTS-1 is used when an [ASME Code, Section XI] required examination results in less than 90 percent coverage.

It requires a review of the procedures to obtain maximum coverage and documentation of the limitation. The procedure also examines whether an alternative method could be used to obtain better coverage as allowed by the [ASME] Code. This procedure was used for all the items identified above and the maximum inspection coverage was achieved.

Limitations are due to design, geometry, and materials of construction of the components. NMC will continue to utilize the most current techniques available for future examinations.

The staff requested additional information for RR No. 21, Item 5 in its e-mail dated May 1, 2006. The licensee responded to the staff's request in its letter dated June 6, 2006, as provided below:

Response to Request for Additional Information (As Stated)

The weld configuration at [Prairie Island, Unit 2] is not included in the PDI sample set configuration [for ASME Code, Section XI, Appendix VIII, Supplement 10]. Consideration was given to developing a site specific mock-up of the W-5 configuration. Since the examination could only be examined on the cast stainless side, the decision was made to not make a site specific mock-up. The industry has not been successful in demonstrating [ASME Code, Section XI,] Appendix VIII techniques on cast stainless steel.

Since no coverage could be obtained with a [ASME Code, Section XI, Appendix VIII,] Supplement 10 technique, NMC then considered performing a RT [radiographic test] for the required volumetric examination. A work order (0408974) was written to perform the RT. When planning for the performance of the RT, it was noted that in order to conduct this examination, the water level would need to be lowered below the hot leg piping;

therefore, the RT examination could not be performed as the Reactor Coolant System (RCS) water level would have to be below the bottom of the hot leg. This would have placed the plant in a less safe condition and therefore, the decision was made to not perform the RT.

The decision was made to examine from the cast stainless material with dual 45-degree refracted L-waves, 1.0 MHz, which is the technique described in WCAP-11778, "Demonstration of Flaw Detection and Characterization Capabilities for Ultrasonic Examination of Main Loop Welds." The coverage obtained with this technique was reported in the original relief request. The examination was performed to the 1989 [Edition of Section XI of the ASME Code] and WCAP-11778, which has been the industry accepted technique. As of the date of this letter, NMC is not aware of other methods that have been developed and qualified.

The nominal frequency was 1.0 MHz. For the dual transducers, the center frequency of one transducer was 0.95 MHz, and 1.05 MHz for the other transducer. The calibration block used was the Prairie Island RC Loop calibration block P-55, material SA 351 CF8A. The UT calibration reflectors were the 3/4t side drilled hole and the 10 percent ID notch. The reference reflector was set off the 10 percent ID notch. Scanning was performed at reference sensitivity due to the excessive material noise from the component for both the axial and circumferential scans. The technique was performed in accordance with procedure SWI NDE-UT-11, which is based on the technique from WCAP-11778.

When considering the ultrasonic examination from the ID surface, the technique used for the RCS primary inlet and outlet nozzles is performed with an RPV tool with an extension into the nozzles. The delivery tool for the examination of this weld would not reach this far into the RCS piping. At this time, no vendors have qualified specific tooling for entrance into the steam generator bowl for examination of the hot leg.

Staff Evaluation

The ASME Code requires that 100 percent volumetric and surface examinations of all Class 1 dissimilar metal welds be performed during each inspection interval. Further, 10 CFR 50.55a(g)(6)(ii)(C), requires that licensees, when performing UT examinations of these welds, implement examination procedures, personnel and equipment that have been qualified through performance demonstration to the requirements of the 1995 Edition, 1996 Addenda (or later Edition/Addenda approved by NRC) of the ASME Code, Section XI, Appendix VIII, Supplement 10. The latter requirement became effective for all licensees as of November 22, 2002.

The subject weld is on the primary inlet (hot-leg) of Steam Generator 22 and joins a wrought carbon steel nozzle to a statically cast austenitic stainless steel short radius elbow. The nozzle has a buttered layer of 308L stainless steel used as a safe end to allow the carbon steel nozzle to be field welded to the austenitic piping without further heat treatment. No Alloy 600, 52, or 182 exists at this location.

The licensee elected to perform the subject examination, which occurred on May 23, 2005, to the requirements of ASME Code, Section XI, Appendix III in lieu of using Appendix VIII

performance demonstrated techniques, as required by 10 CFR 50.55a. The licensee stated that this examination was supplemental, due primarily to the fact that the industry's PDI has yet to develop a suitable mock-up of this Prairie Island, Unit 2 dissimilar metal weld configuration, and therefore, no performance demonstrated procedures, personnel, or equipment are available for the examination. However, it is incumbent on each licensee to comply with requirements listed in 10 CFR 50.55a and the ASME Code, regardless of the status of industry initiatives, or to submit an alternative for review and approval by the NRC. Since mandatory implementation of the performance demonstration requirement became effective on November 22, 2002, and the subject examination was not performed until May 23, 2005, the licensee had ample opportunity to either develop a suitable mock-up and methodology to demonstrate the technique, or to seek approval of an alternative.

The licensee stated that the industry standard practice for cast stainless steel piping welds is to use the guidance described in WCAP-11778, *Demonstration of Flaw Detection and Characterization Capabilities for Ultrasonic Examination of Main Loop Welds*, which recommends the use of 1.0 MHz, dual, 45-degree refracted longitudinal waves for these welds. This method has historically been shown to be unreliable for inspecting cast stainless steel during round robin exercises.[2,3] The industry position, to date, is not to pursue NDE developments for cast stainless steel piping, but this does not relieve the licensee's responsibility to meet 10 CFR 50.55a requirements for dissimilar metal welds, even if a portion of the weld consists of cast material.

Further, the licensee stated that the most current techniques available will be used for examinations at NMC. However, recent activities funded by the NRC's Office of Nuclear Regulatory Research[4,5,6] indicate that low-frequency phased array methods may be capable of detecting flaws in cast stainless piping welds; this technology is essentially "off-the-shelf" and could be field-deployed with only minor equipment modifications.

The NRC staff concludes that the ASME Code, Section XI, Appendix III-based UT examination performed on dissimilar metal weld W-5 has not been shown to be reliable to detect service-induced degradation, and that the licensee has failed to implement ASME Code, Section XI, Appendix VIII performance demonstrated techniques in accordance with the requirements of 10 CFR 50.55a(g)(6)(ii)(C). For these reasons, it is inappropriate to evaluate the limited

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2 NUREG/CR-3753, *An Evaluation of Manual Ultrasonic Inspection of Cast Stainless Steel Piping*, U.S. NRC, May 1984.

3 NUREG/CR-5068, *Piping Inspection Round Robin*, U.S. NRC, April 1996.

4 A.A. Diaz, M.T. Anderson, S.E. Cumblidge, S.R. Doctor, *NDE Assessments of Cast Stainless Steel reactor Piping Components*, Proceedings for the 4th International Conference on NDE in Relation to Structural Integrity for Nuclear and Pressurized Components, EPRI/JRC, London, U.K., December 2004.

5 S.R. Doctor, M.T. Anderson, A.A. Diaz, S.E. Cumblidge, *Progress in the Reliable Inspection of Cast Stainless Steel Reactor Piping Components*, 18th International Conference on Structural Mechanics in Reactor Technology (SMiRT 18), Beijing, China, August 2005.

6 M.T. Anderson, S.E. Cumblidge, S.R. Doctor, *An Assessment of Low Frequency Phased Array Methods to Detect and Characterize Cracks in Cast Stainless Steel Piping*, Proceedings of 4th EPRI Phased Array Conference, Miami, FL, December 2005.

examination coverage described in the licensee's request for relief. Therefore, the staff denies Item 5 of Prairie Island, Unit 2 RR No. 21.

3.3 Request for Relief No. 21, Item 6, ASME Code, Section XI, Examination Category B-J, Item B9.11, Pressure Retaining Welds in Piping

ASME Code Requirement

ASME Code, Section XI, Examination Category B-J, Item B9.11 requires surface and volumetric examinations, as defined by Figure IWB-2500-8, of essentially 100 percent of the length of selected Class 1 full penetration circumferential piping welds. 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, 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.

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100 percent of the ASME Code-required inspection volume shown in Figure IWB-2500-8, for valve-to-pipe weld W-11 on the Residual Heat Removal (RHR) piping system.

Licensee's Basis for Relief Request (As Stated)

This piping weld is subject to be examined by both volumetric and surface examination methods. The volumetric examination was performed using personnel and procedures qualified in accordance with Appendix VIII, Supplement 2. The examination was conducted using 45 and 60-degree transducers. The valve and piping material are austenitic stainless steel. The examination is limited to 50 percent in both the axial and circumferential directions from the piping side of the weld due to the weld joint configuration connection to the valve. The credited volumetric examination of the Weld Required Volume (WRV) was limited to 47.77 percent and only a single-sided examination could be performed. It should be noted that the volumetric examination was performed through 100 percent of the [ASME] Code WRV; however, the PDI Appendix VIII procedure used is not qualified for the detection of flaws on the far side of single sided access examinations on austenitic stainless steel piping welds. The techniques employed for the examination provide for a best-effort examination. As an alternative to the ultrasonic examination, radiography was considered and determined to be an unacceptable substitute due to radiological constraints, weld configuration, and the undue hardship imposed without offering any commensurate increase in safety with cost benefit.

The required surface examination was performed using liquid penetrant and was not limited. One hundred percent of the required surface area was inspected. No relevant indications were detected.

Licensee's Proposed Alternative Examination (As Stated)

All in-service inspections at Prairie Island Unit 2 have been completed to the greatest extent practical. When limitations to required inspections are encountered, Prairie Island's "Limitations to NDE" procedure SWI NDE-LTS-1 was applied. SWI NDE-LTS-1 is used when an ASME Section XI Code required examination results in less than 90 percent coverage. It requires a review of the procedures to obtain maximum coverage and documentation of the limitation. The procedure also examines whether an alternative method could be used to obtain better coverage as allowed by the [ASME] Code.
This procedure was used for all the items identified above and the maximum inspection coverage was achieved.

Limitations are due to design, geometry, and materials of construction of the components. NMC will continue to utilize the most current techniques available for future examinations.

The staff requested additional information for RR No. 21, Item 6, in its e-mail dated May 1, 2006. The licensee responded to the staff's request in its letter dated June 6, 2006, as provided below:

Response to Request for Additional Information (As Stated)

The 1995 Edition, 1996 Addenda of the ASME Code was applied for this examination. The 45-degree examination was a shear wave and the 60-degree examination was a refracted longitudinal wave.

Staff Evaluation

The ASME Code requires essentially 100 percent volumetric and surface examination of selected ASME Code Class 1 full penetration piping welds. In addition, the ASME Code requires that the volumetric examination be conducted from both sides of these pressure retaining girth welds. However, the pipe-to-valve configuration of weld W-11 on the RHR system limits ultrasonic scanning to the pipe side of the weld only. For the licensee to achieve 100 percent volumetric coverage, the subject pipe-to-valve weld would have to be redesigned and modified. This would place a significant burden on the licensee; thus, the NRC staff concludes that the ASME Code-required 100 percent volumetric examinations are impractical.

As shown on the sketches and technical descriptions[7] provided in response to the staff's request, the licensee was able to obtain approximately 48 percent aggregate coverage of the ASME Code-required examination volume, including nearly 100 percent of the required volume with axial and circumferential scans from the austenitic wrought pipe side of the weld using 45-degree shear and 60-degree refracted longitudinal waves. The outside surface taper of the cast austenitic valve body prevented ultrasonic scanning from the valve side of the weld. In addition, the licensee completed 100 percent of the ASME Code-required surface examination on weld W-11 with no limitations. No relevant indications were found during the volumetric and

7 Sketches and technical descriptions provided by the licensee are not included in this report.

surface examinations. UT examination of weld W-11 was conducted using personnel, equipment and procedures qualified in accordance with ASME Section XI, Appendix VIII, Supplement 2, 1995 Edition with the 1996 Addenda, as administered through the PDI program.

The NRC staff concludes that, due to the pipe-to-valve design, examining the ASME Code-required volume from both sides of the weld is impractical for RHR system weld W-11. Based on the volumetric coverage obtained from the pipe side of the weld, in conjunction with the full surface examination performed, it is reasonable to conclude that if significant service-induced degradation were occurring in the subject weld, evidence of it would be detected by the examinations that were performed, and the examinations performed provide reasonable assurance of structural integrity of the subject weld.

3.4 Request for Relief No. 21, Item 7, ASME Code, Section XI, Examination Category C-F-2, Item C5.80, Pressure-Retaining Welds in Carbon or Low Alloy Steel Piping

ASME Code Requirement

ASME Code, Section XI, Examination Category C-F-2, Item C5.80, requires surface and volumetric examinations, as defined by Figure IWC-2500-7, of essentially 100 percent of the length of selected Class 2 full penetration circumferential piping welds. 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, 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.

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100 percent of the ASME Code-required inspection volume shown in Figure IWB-2500-7, for tee-to-flange weld W-14 on the Main Steam piping system.

Licensee's Basis for Relief Request (As Stated)

This tee to flange pipe weld is subject to be examined by both volumetric and surface examination methods. The reducer tee and pipe materials are carbon steel. The volumetric examination was performed using personnel and procedures qualified in accordance with Appendix VIII, Supplement 3. The examination was conducted using 45 and 60-degree transducers. The piping materials are A155 KC70. The credited volumetric examination of the WRV was limited to 74.85 percent. As an alternative to the ultrasonic examination, radiography was considered and determined to be an unacceptable substitute due to radiological constraints, weld configuration, and the undue hardship imposed without offering any commensurate increase in safety with cost benefit.

The required surface examination was performed using Dye Penetrant [PT] and 95.8 percent of the required surface area was inspected (Inspection Report No. 2005P043). No relevant indications were detected.

Licensee's Proposed Alternative Examination (As Stated)

All in-service inspections at Prairie Island Unit 2 have been completed to the greatest extent practical. When limitations to required inspections are encountered, Prairie Island's "Limitations to NDE" procedure SWI NDE-LTS-1 was applied. SWI NDE-LTS-1 is used when an ASME Section XI Code required examination results in less than 90 percent coverage. It requires a review of the procedures to obtain maximum coverage and documentation of the limitation. The procedure also examines whether an alternative method could be used to obtain better coverage as allowed by the [ASME] Code.
This procedure was used for all the items identified above and the maximum inspection coverage was achieved.

Limitations are due to design, geometry, and materials of construction of the components. NMC will continue to utilize the most current techniques available for future examinations.

The staff requested additional information for RR No. 21, Item 7, in its e-mail dated May 1, 2006. The licensee responded to the staff's request in its letter dated June 6, 2006, as provided below:

Response to Request for Additional Information (As Stated)

The 1995 Edition, 1996 Addenda of the ASME Code was applied for this examination. The [piping] support is H-4, which is on 2-ISI-47B (Header Restraint #8). This is a very large restraint that bolts through two floor elevations and is saddled on both sides of the weld to be examined. This restraint limits all four scan directions.

Staff Evaluation

The ASME Code requires 100 percent volumetric and surface examination of selected Class 2 full penetration piping welds. In addition, the ASME Code requires that the volumetric examination be conducted from both sides of these pressure retaining girth welds. However, the bolted flange-to-tee configuration of weld W-14 on the main steam system, and a rigid pipe support, limit ultrasonic scanning on this weld. For the licensee to achieve 100 percent volumetric coverage, the subject flange-to-tee weld would have to be redesigned and modified. This would place a significant burden on the licensee; thus, the NRC staff concludes that the ASME Code-required 100 percent volumetric examinations are impractical at Prairie Island, Unit 2.

As shown on the sketches and technical descriptions[8] provided in the request, the licensee was able to obtain approximately 75 percent aggregate coverage of the staff concludes ASME Code-required examination volume from the tee side of the weld using 45-degree and 60-degree shear waves. The outside surface taper and limited scan area adjacent to the bolted flange prevented ultrasonic scanning from the flange side of the weld. In addition, the licensee

8 Sketches and technical descriptions provided by the licensee are not included in this report.

completed the ASME Code-required surface examination on weld W-14 with no limitations. No relevant indications were found during the volumetric and surface examinations. UT examination of weld W-14 was conducted using personnel, equipment and procedures qualified in accordance with ASME Section XI, Appendix VIII, Supplement 3, 1995 Edition with the 1996 Addenda, as administered through the PDI program.

The NRC staff determined that, due to the flange-to-tee design, examining the ASME Code-required volume from both sides of the main steam system weld W-14 is impractical. Therefore, based on the volumetric coverage obtained from the tee side of the weld, in conjunction with the full surface examination performed, it is reasonable to conclude that if significant service-induced degradation were occurring in the subject weld, evidence of it would have been detected by the examinations that were performed, and the examinations performed provide reasonable assurance of structural integrity of the subject weld.

4.0 CONCLUSIONS

The NRC staff has reviewed the licensee's submittal and concludes that ASME Code examination coverage requirements are impractical for the subject welds listed in Items 1 through 4, 6 and 7 for Request for Relief 21, Revision 0. Furthermore, based on the coverages obtained, if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would be detected by the examinations that were performed, and the examinations performed provide reasonable assurance of structural integrity of the subject welds. Therefore, for Items 1 through 4, 6 and 7, relief is granted, pursuant to 10 CFR 50.55a(g)(6)(i), for the Prairie Island, Unit 2, third 10-year ISI inspection interval.

The NRC staff concludes that for the full penetration dissimilar metal nozzle-to-pipe weld W-5 on the inlet nozzle of Steam Generator 22, as described in Item 5 of Request for Relief 21, Revision 0, the licensee has failed to meet ASME Code requirements relative to the implementation of PDI examination methods. Therefore, RR No. 21, Item 5 is denied for the Prairie Island, Unit 2 third 10-year ISI inspection interval.

The staff has determined that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) for Items 1, 2, 3, 4, 6, and 7 of RR No. 21 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 ASME Code, Section XI requirements for which relief was not specifically requested and approved in this RR remain applicable, including third-party review by the authorized Nuclear Inservice Inspector.

Attachment:
Summary Table

Principal Contributor: T. McLellan

Date: August 29, 2006

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Units 1 and 2

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PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2
Third 10-Year ISI Interval

SUMMARY OF RELIEF REQUESTS

Relief Request Number	TLR RR Sec.	System or Component	Exam. Category	Item No.	Volume or Area to be Examined	Required Method	Licensee Proposed Alternative	Relief Request Disposition
21, Rev. 0 Items 1 through 4	3.1	RPV Nozzle-to-Shell Welds	B-D	B3.90	100% of full penetration primary coolant outlet and safety injection nozzle-to-shell welds on the RPV	Volumetric	Use achieved 79% and 59% volumetric coverages, respectively	Granted 10 CFR 50.55a(g)(6)(i)
21, Rev. 0 Item 5	3.2	SG Nozzle-to-Pipe Weld	B-F	B5.70	100% of inner 1/3 volume of full penetration dissimilar metal nozzle-to-safe end welds	Volumetric and Surface	Use achieved 78% volumetric coverage	Denied
21, Rev. 0 Item 6	3.3	Class 1 Piping Weld	B-J	B9.11	100% of inner 1/3 volume of full penetration Class 1 piping welds	Volumetric and Surface	Use achieved 48% volumetric coverage	Granted 10 CFR 50.55a(g)(6)(i)
21, Rev. 0 Item 7	3.4	Class 2 Piping Weld	C-F-2	C5.80	100% of inner 1/3 volume of full penetration Class 2 piping welds	Volumetric and Surface	Use achieved 75% volumetric coverage	Granted 10 CFR 50.55a(g)(6)(i)

SUMMARY TABLE