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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Prairie Island Nuclear Generating Plant Unit 2
Docket 50-306
License No. DPR-60

Response to Request for Additional Information on Relief No. 21 for Unit 2 Third 10-Year Interval Inservice Inspection Program

By letter dated September 8, 2005, Nuclear Management Company, LLC (NMC) submitted a request for relief for the Unit 2 third 10-year interval inservice inspection program. The purpose of the relief request was to submit for "limited examinations" associated with the third 10-year inservice inspection examination plan for Unit 2. This examination plan was submitted by letter dated April 19, 1995, and subsequently approved by the NRC on February 22, 1996. The Prairie Island Nuclear Generating Plant Unit 2, third 10-year ISI interval began on December 21, 1994, and ended on December 20, 2005, as allowed by Section XI, IWA-2430.

By electronic mail dated May 1, 2006, the NRC issued a request for additional information (RAI) on the subject relief request. Enclosure 1 provides the responses to RAI for Prairie Island Nuclear Generating Plant.

Summary of Commitments

This letter contains no new commitments and no revisions to existing commitments.

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Site Vice President, Prairie Island Nuclear Generating Plant
Nuclear Management Company, LLC

Enclosure (1)

cc: Administrator, Region III, USNRC
Project Manager, Prairie Island, USNRC
Resident Inspector, Prairie Island, USNRC

ENCLOSURE 1
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
PRAIRIE ISLAND NUCLEAR GENERATING PLANT

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

Nuclear Regulatory Commission (NRC) Request

1) The licensee stated that examinations of the RPV primary outlet nozzle-to-shell welds were limited in both the parallel and perpendicular scans from the vessel ID to 78.56% of the required ASME Code volume. However, a review of the Wesdyne Report for Welds N-7 and N-10 show that nearly 100% volumetric coverage for scans performed perpendicular to the welds was obtained. This included scans from the bore side of the nozzle, and it is assumed, also from the vessel side ("Star" scan).

   a) Please clarify whether the coverage reported (99.52%) for scans performed perpendicular to these welds is correct.

Nuclear Management Company, LLC (NMC) Response

1) a) The combined coverage of 99.52 % for the perpendicular scan as reported is correct. The Bore/Star scan coverage for the weld (99.68%) and the base metal volume (99.35%) were added together and divided by 2 to produce 99.52%.

NRC Request

   b) Also, further define the "Star" scan, as reported in the Wesdyne document.

NMC Response

   b) The star scan is performed in a radial pattern from the vessel wall and the bore scan is performed from the inside of the nozzle bore. The star scan has 6 channels with two 45-degree L-wave transducers directed toward the nozzle, two 45-degree L-wave transducers directed away and two 45-degree shear waves (one toward and one away). The star scans are used in conjunction with the nozzle bore scans to obtain coverage in the perpendicular direction.

NRC Request

   c) Provide further explanation as to how the proximity of the nozzle protrusion limited the parallel, or tangential, scans for the primary outlet nozzle-to-shell welds.

NMC Response

c) 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.

NRC Request

2) For RPV safety injection nozzle-to-shell Welds N-8 and N-11, only 59.26% coverage was reported by the licensee. The reason for limited coverage was listed as "the proximity of the outlet nozzle protrusion to the nozzle to shell weld."

a) Provide further explanation as to how the RPV primary outlet nozzle protrusions caused limited scans on the safety injection nozzles.

NMC Response

2) a) The reason given for the limited coverage 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.

NRC Request

b) Describe why the weld volumes exhibited such limited coverages for the 45 shear (15.55%), 45 longitudinal single (0%), and 45 longitudinal dual (0%) transducers on the circumferential (tangential) scans.

NMC Response

b) The weld volumes exhibited such limited coverages for the 45 shear (15.55%), 45 longitudinal single (0%), and 45 longitudinal dual (0%) 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% coverage is obtained in this direction. The perpendicular scans have a combined coverage of 92.78% for N8 and N11.

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

NRC Request

1) Confirm whether dissimilar metal Weld W-5 is on the primary outlet or inlet nozzle of Steam Generator 22.

NMC Response

1) The dissimilar metal weld W-5 is on the primary inlet nozzle of Steam Generator 22.

NRC Request

2) The licensee stated that Weld W-5 is an elbow-to-safe end weld, and that the materials for the elbow and safe end are SA 351-CF8 included in the submittal show the carbon steel steam generator nozzle to have a stainless steel buttering, with the full penetration dissimilar metal weld joining this buttering to a statically cast short radius elbow. Therefore, the "safe end" is assumed to be the 308L stainless steel buttering. However, the photograph of this weld (DSC01640.JPG) appears to show a second circumferential weld crown approximately 6-8-inches upstream of Weld W-5. Confirm that there is no actual wrought or cast safe end pipe segment in this configuration. Also provide the nominal pipe outside diameter and wall thickness for each component associated with Weld W-5.

NMC Response

2) There is no wrought or cast safe end pipe segment in this configuration. The picture provided with the original relief request submittal shows that the OD surface has been machined and ground, giving the appearance of an additional weld. The component configuration is as previously reported. The 50-degree reducing elbow inside diameter is 31 inches, and the average wall thickness is 3.1 inches, which provides for a pipe outside diameter of 34.1 inches.

NRC Request

3) The licensee stated that dissimilar metal Weld W-5 was examined to ASME Code, Appendix III requirements. However, 10 CFR 50.55a(g)(6)(ii)(C)(1) and (2), Implementation of Appendix VIII to Section XI, specifically require the 1995 Edition, with 1996 Addenda, and Appendix VIII, Supplement 10, Qualification Requirements for Dissimilar Metal Piping Welds, to be implemented for all dissimilar metal weld examinations conducted after November 22, 2002. The licensee conducted this examination on May 23, 2005. Therefore, it appears the licensee may have failed to meet the requirements of the Code of Federal Regulations.

The licensee's reason for not meeting the performance demonstration requirements of Appendix VIII, Supplement 10, is that the configuration of Weld W-5 is not covered by the demonstration samples currently available at the Electric Power Research Institute (EPRI) Performance Demonstration Initiative (PDI) center. The licensee further stated that because of the design of the weld joint, no mock-up could be created to demonstrate performance in accordance with Appendix VIII, Supplement 10. While this configuration is not a typical, or generic, design for Westinghouse PWRs, and may not for this reason presently be available under PDI, it is incumbent on each licensee to meet CFR requirements, or propose an alternative in accordance with 10 CFR 50.55a(a)(3).

a) The NRC staff disagrees with the licensee's contention that the weld design could not be re-created in a mock-up. In many cases, licensees have built site-specific mock-ups due to unique designs or weld configurations at their plants. Explain why Nuclear Management Company, LLC could not fabricate a mock-up and conduct a performance demonstration for the procedure, personnel, and equipment to be used when examining the subject weld, given the time available between the implementation date in CFR (November 22, 2002), and the examination date (May 23, 2005).

NMC Response

3 a) The weld configuration at PINGP for Supplement 10 is not included in the PDI sample set configuration. 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 Appendix VIII techniques on cast stainless steel.

Since no coverage could be obtained with a Supplement 10 technique, NMC then considered performing a RT 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 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.

NRC Request

b) The ASME Code provides minimum prescriptive-based examination criteria in Section XI, Appendix III. In Appendix III, Supplement 4, Paragraph 4(c), the ASME Code recommends that, for austenitic and dissimilar metal welds, licensees qualify examiners and procedures using welded samples, and simulated or actual flaws located in positions where geometry may make them more difficult to detect. The purpose of the examination procedure qualification is to determine that the proposed technique is capable of detecting the specified flaws of interest and that the capabilities and limitations are identified. Discuss why this type of qualification could not be performed at Prairie Island 2.

Note: Presentations concerning the use of qualification "add-ons" and site-specific mock-ups been made at recent EPRI PDI meetings (Summary of Public Meeting - ADAMS ML052580153 and Dissimilar Metal Weld Qualification - ADAMS ML05265166).

NMC Response

b) The examination was performed to the 1989 ASME Section XI 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.

NRC Request

c) The licensee stated that the examination was performed using 45-degree refracted longitudinal wave transducers. However, the licensee did not provide transducer frequency and other information necessary to assess whether this technique may be adequate to penetrate the coarse-grained cast material in the short radius elbow. Provide the center frequency and bandwidth of the transducers used, describe the calibration block used and discuss the amplitude and shape of the DAC curve established from the calibration block responses. Include reference and scan gain settings, and the typical screen height of material baseline noise observed during the examination of W-5.

NMC Response

c) 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% ID notch. The reference reflector was set off the 10% 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.

NRC Request

d) The ASME Code, Appendix III provides minimum criteria for performing prescriptive-based UT. However, licensees may use additional equipment and expertise to perform an examination. Extensive research, round-robin testing, and demonstrations have been performed on cast austenitic material using different transducer configurations [phased array, Synthetic Aperture Focusing (SAFT-UT), low frequency twin crystals, etc.] and data manipulation (post processing via computer) techniques. These methods have been shown to dramatically improve inspection capability in cast stainless steel piping welds. Discuss any advanced equipment and UT techniques that were considered and were determined to be ineffective for this application.

Note: Preliminary results of research in advanced UT methods for coarse-grained materials have been published in several recent conference proceedings (Notes 1,2,3).

NMC Response

d) The examination was performed to the 1989 ASME Section XI 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.

NRC Request

e) The staff is aware that during each refueling outage, the steam generator channel heads are opened to provide robotic access for tubing examinations. This may also provide access to the subject weld from the inside surface of the nozzle/piping. If a qualified examination from the outside diameter is not considered feasible, discuss whether access to examine this weld is available from the inside of the steam generator channel head. Also discuss whether the PDI mock-up specimens for inside diameter examination on the RPV nozzles may be used to support an examination from the inside of the steam generator.

NMC Response

e) NMC did explore other volumetric techniques (i.e., RT from the ID). 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 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.

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.

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

NRC Request

a) The licensee stated that valve-to-pipe Weld W-11 was examined using procedures, personnel, and equipment qualified in accordance with ASME Code, Appendix VIII, Supplement 2. Please confirm that the 1995 Edition, 1996 Addenda of the ASME Code was applied for this examination.

NMC Response

a) The 1995 Edition, 1996 Addenda of the ASME Code was applied for this examination.

NRC Request

b) It was stated that 45 and 60-degree transducers were used. It appears from the coverage sketch included in the submittal that the 45-degree examination was a shear wave and the 60-degree was a refracted longitudinal wave. Please confirm.

NMC Response

b) The 45-degree examination was a shear wave and the 60-degree examination was a refracted longitudinal wave.

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

NRC Request

a) The licensee stated that flange-to-tee Weld W-14 was examined using procedures, personnel, and equipment qualified in accordance with ASME Code, Appendix VIII, Supplement 3. Please confirm that the 1995 Edition, 1996 Addenda of the ASME Code was applied for this examination.

NMC Response

a) The 1995 Edition, 1996 Addenda of the ASME Code was applied for this examination.

NRC Request

b) In the licensee's submittal, the cross-sectional sketch of the access limitation caused by the outside surface geometry of the flange is adequately depicted. Page 4 of 4 of the supplemental report also states scans were limited by interference from a piping support, and photographs of the weld are shown. However, these photographs and brief comments on the supplemental report do not adequately describe the limitation to scans caused by support interference. Please describe the support, and how it impacts the ASME Code-required scans for this weld.

NMC Response

b) The 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. Figure 1 below provides detail of the header restraint.

Figure 1: Detail of header restraint