February 9, 2001

Mr. Mark Reddemann
Site Vice President
Kewaunee and Point Beach Nuclear Power Plants
Nuclear Management Company, LLC
6610 Nuclear Road
Two Rivers, WI 54241

SUBJECT: KEWAUNEE NUCLEAR POWER PLANT - THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN REQUEST FOR RELIEF RR-G-4 (TAC NO. MB0307)

Dear Mr. Reddemann:

By letter dated October 13, 2000, Nuclear Management Company, LLC (NMC), the licensee for Kewaunee Nuclear Power Plant (KNPP), requested Nuclear Regulatory Commission (NRC) approval of an alternative to the inservice inspection (ISI) and repair/replacement programs of the 1989 Edition of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code*, Section XI pursuant to the provisions of 10 CFR 50.55a(a)(3)(ii). Instead of hydrostatic pressure test requirements specified by ASME Section XI, you propose to use ASME Code Case N-416-2 as an alternative.

The NRC staff has reviewed your request and concluded that compliance with ASME Section XI would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The NRC staff concluded that the alternative proposal of using ASME Code Case N-416-2 provides reasonable assurance of structural integrity of the subject components. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the NRC authorizes your proposed alternative of using ASME Code Case N-416-2 for the third 10-year ISI interval or until such time as Code Case N-416-2 is referenced in 10 CFR 50.55a. At that time, if you intend to continue to implement this code case, you should follow provisions referenced in Code Case N-416-2, with limitations identified in 10 CFR 55a, if any.

Further details regarding the NRC staff's evaluation and conclusions are enclosed. This letter completes the NRC staff's effort for this relief request (TAC No. MB0307).

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and the enclosures will be available for public inspection at the NRC's Public Document Room, located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland. Publicly available records are accessible electronically from the ADAMS Public Library component on the NRC Web site http://www.nrc.gov (the Electronic Reading Room).

If you have any questions regarding this matter, please contact me at 301-415-1389.

Sincerely,

/RA by T. Kim for/

Claudia M. Craig, Section Chief, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No: 50-305

Enclosure: As stated

cc w/encl: See next page

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cc w/encl: See next page

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* See memo from E. Sullivan to C. Craig dated January 9, 2001.

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN

REQUEST FOR RELIEF RR-G-4

KEWAUNEE NUCLEAR POWER PLANT

NUCLEAR MANAGEMENT COMPANY

DOCKET NUMBER 50-305

1.0 INTRODUCTION

By letter dated October 13, 2000, Nuclear Management Company, LLC (NMC), the licensee for Kewaunee Nuclear Power Plant (KNPP), requested the Nuclear Regulatory Commission (NRC) approval of an alternative to the inservice inspection (ISI) and repair/replacement programs of the 1989 Edition of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (B&PV), Section XI pursuant to the provisions of 10 CFR 50.55a(a)(3)(ii). Instead of hydrostatic pressure test requirements specified by ASME Section XI, the licensee proposed to use ASME Code Case N-416-2 as an alternative.

2.0 BACKGROUND

Inservice inspection of the ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME B&PV Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the Nuclear Regulatory Commission (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 (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 Code of record for the Kewaunee Nuclear Power Plant third 10-year ISI interval is the 1989 Edition of the ASME B&PV Code.

ENCLOSURE

3.0 EVALUATION

The NRC staff has reviewed the information concerning ISI program Request for Relief RR-G-4 for the third 10-year interval for KNPP provided in a NMC letter dated October 13, 2000.

The information provided by NMC in support of the request for relief from Code requirements has been evaluated, and the basis for disposition is documented in this safety evaluation.

3.1 Request for Relief RR-G-4 IWA-4000 Hydrostatic Pressure Test for Welded Repairs or Installation of Replacement Items by Welding

Components for Which Relief is Requested:
Class 1, 2, and 3, Examination B-P, C-H, D-A, D-B, and D-C, pressure retaining components.

Code Requirement: ASME Section XI, 1989, IWA-4000(a) requires that a system hydrostatic test be performed in accordance with IWA-5000 after repairs by welding in a pressure-retaining boundary.

Licensee's Code Relief Request (As stated):
"KNPP is requesting approval to use ASME Code Case N-416-2, "Alternative Pressure Test Requirement for Welded Repairs, Fabrication Welds for Replacement Parts and Piping Subassemblies, or Installation of Replacement Items by Welding, Class 1, 2, and 3 Section XI, Division I," (Reference 1)[1]. Use of the code case is being requested for application to all Class 1, 2, and 3 ASME Section XI pressure retaining components within the scope of the KNPP Section XI ISI and Repair/Replacement Programs. This request also includes the repair/replacement welding activities that are associated with the upcoming KNPP steam generator replacement project. Code Case N-416-2 is applicable to the following welds associated with the replacement steam generator project:

- secondary side fabrication welds,
- secondary side piping installation welds,
- steam dome-to-transition cone installation girth welds,
- primary side safe end to channel head nozzle fabrication welds,
- primary side piping installation welds."

Licensee's Basis for Requesting Relief (as stated):

"ASME Class 1, 2, and 3 Pressure Retaining Items

"The basis for applying Code Case N-416-2 to the ASME Class 1, 2, and 3 pressure retaining items is identical to the basis submitted to the NRC for approval of Code Case N-416-1, shown

[1] 1. Reference 1 is the licensee's reference to Code Case N-416-2 in its submittal dated October 13, 2000

in Reference 2[2]. Below please see an excerpt taken from Reference 2 that discusses the basis for the request for N-416-1. The "Licensee's Basis for Request," Section 2.2, RR-G-3, Code Case N-416-1 reads:

"Satisfying this provision of the Code requires significant resources for planning, scheduling, maintenance, engineering, and procedure writing to address operational concerns and personnel and plant safety issues related to placing the plant in a non-conventional configuration to support, isolate, or obtain an above-normal operating pressure required for hydrostatic testing. This relief request is being submitted at this time, because of the ongoing hardship of performing hydrostatic pressure tests associated with repair and replacement activities. Hardships or unusual difficulties caused by hydrostatic pressure testing have been identified relating to operations, scheduling, and cost, and are discussed herein.

"During hydrostatic testing, the affected system is unavailable to support plant operations, even if called upon to perform its safety function for the time required to isolate and align the system; perform fill and vent operations; connect an external pump and provide adequate relief capability for the system; maintain pressure for at least 4 hours for insulated components; install and remove blank flanges and jumpers; reinstall/test safety and relief valves; recalibrate instrumentation; and align the system for service; etc. Although hydrostatic testing is performed with the utmost of care, utilizing detailed procedures and trained personnel, there is a very small probability of damaging plant equipment, misaligning equipment, or experiencing some other unforeseen incident which could affect plant safety. Experience indicates that the approximate cost of hydrostatically testing a segment of piping ranges from $10,000 to $20,000 considering the support activities. As indicated above, this code requirement can have a significant effect on the flow and length of a refueling outage or unscheduled shutdown. Typically, hydrostatic pressure testing of a segment of piping would delay availability of the system, by at least two shifts, due to activities associated with tagout control, system line-up, fill and venting; etc."

"The alternative pressure test and NDE permitted by Code Case N-416-1 fulfill the same purpose as a hydrostatic pressure test, i.e., a check for component leakage at a reduced cost while increasing plant safety. Safety is increased when pressure testing is selected over hydrostatic testing because: 1) the affected system would be available to perform its safety function sooner, if needed, 2) the probability of challenging the pressure integrity of any affected component or causing an inadvertent actuation of a safety/relief valve or safety feature is reduced, and 3) the elimination of jumpers and blank flanges reduces the possibility of damage to pipe connections and relief valves, which could cause system leakage or valve inoperability."

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2. Reference 2 is the licensee's reference to NRC's approval for the licensee to use Code Cases N-416-1 and N-498-1 in its submittal dated October 13, 2000.

“Kewaunee Steam Generator Replacement Project

“The KNPP steam generator replacement project will install two (2) new steam generator lower assemblies (SGLAs), refurbish and reuse the existing steam domes, and modify the steam generator support structures and connecting piping/instrumentation systems to accommodate the new SGLAs. The replacement steam generators (RSGs) are comprised of Westinghouse model 54F lower units with refurbished steam drums and modified feedring/thermal sleeve assemblies. The Westinghouse model 54F RSGs are designed to be a like-in-kind replacement for the original Westinghouse model 51 steam generators. The RSGs are being designed by Westinghouse and manufactured by Ansaldo Energia in accordance with ASME Section III, 1986 Edition, 1987 Addenda. Westinghouse reconciled the overall design of the RSGs between the ASME Section III, 1986 Edition, 1987 Addenda, and the original steam generator code of record, ASME Section III Class A, 1965 Edition, summer 1966s Addenda, Code Case No. 1429. Each SGLA is considered a Section III nuclear part. As such, each SGLA will be stamped with an ASME NPT stamp, by Ansaldo, prior to shipment to the Kewaunee plant.”

“The RSGs will be installed in the Kewaunee plant by completing the installation welds that will join the new SGLAs to the refurbished steam domes. Also, the primary and secondary piping installation welds will be completed as part of the steam generator replacement project. Bechtel Power Corporation and its subcontractors will perform the RSG installation. The installation will be performed in accordance with approved Directives and Procedures as required by the Kewaunee Operational Quality Assurance Program and the Kewaunee Repair/Replacement Program, which comply with ASME Section XI, 1989 Edition, no addenda.”

“The hydrostatic testing of NPT stamped parts installed as replacement items in N-stamped components is not required by the ASME Section III code. Also, ASME Section XI wording, prior to the 1999 ASME Code Addenda, only provides rules for the pressure testing of welded repairs and installation of items by welding (reference Section XI, IWA-4540 and Code Case N-416- 1). Until the ASME approval of Code Case N-416-2, there was a hole between the published Construction Codes and Section XI, including published interpretations, into which the requirement for pressure testing of fabrication welds fell. ASME Code Case N-416-2 clarifies acceptable pressure testing and NDE requirements for these fabrication welds. Code Case N-416-2 permits replacement part fabrication welds to be pressure tested along with the installation welds.”

“Though the Section III code does not require hydrostatic testing of NPT stamped parts, the Kewaunee RSG Certified Design Specification imposed a SGLA primary side hydrostatic test in accordance with the requirements of the Section III construction code. A shop performed Section III hydrostatic test has been successfully performed on the primary side of each SGLA, by Ansaldo Energia, prior to shipment to the Kewaunee plant.”

"A Section III pressure boundary is established at the end of the carbon steel channel head primary nozzles. Prior to the steam generator replacement outage, the safe ends will be welded to the primary side channel head nozzles at the KNPP plant site. This process will be accomplished by Ansaldo Energia and its subcontractors. These welds will be performed in accordance with approved Directives and Procedures as required by the Kewaunee Operational Quality Assurance Program and the Kewaunee Repair/Replacement Program, which comply with ASME Section XI, 1989 Edition, no addenda. KNPP and its Authorized Nuclear Inspector (ANI) have agreed that these RSG channel head primary nozzle to safe end welds are fabrication welds. As stated above, these welds will be performed according to ASME Section XI. The Section III NPT stamp does not include these welds. If approved, KNPP will apply the leak test and NDE provisions specified in Code Case N-416-2 to these welds. If Code Case N-416-2 is not approved, KNPP will be required to perform an additional primary side hydrostatic test, in accordance with ASME Section XI, for these welds."

"A secondary side Section III shop hydrostatic test was originally specified in the RSG Certified Design Specification. The RSG fabrication schedule, at Ansaldo Energia, jeopardized the originally planned KNPP spring 2000 steam generator replacement outage. In an effort to expedite the fabrication schedule, the voluntarily imposed secondary side hydrostatic pressure test, according to Section III, was removed from the design and fabrication specification. Continued fabrication schedule delays have caused the steam generator replacement outage to move to the fall 2001. As such, a Section III shop performed secondary side hydrostatic test will not be performed on the SGLAs."

"A field performed Section XI hydrostatic test, of the RSG secondary sides, will result in a significant hardship to KNPP without a commensurate increase in the assurance of quality and safety of the fabrication and installation welds. A field performed Section XI hydrostatic test will require significant resources from planning, scheduling, maintenance, operations, engineering, health physics and construction. For example, these resources will be required to address plant systems design criteria, address system isolation design methods, design temporary pump/piping systems, and prepare procedures. Significant resources will also be required to address plant safety issues, personnel safety issues, and ALARA issues associated with the plant hydrostatic test configuration and conditions. Performing a RSG hydrostatic test could significantly impact the overall flow and length of the steam generator replacement outage. Activities required to isolate systems, configure temporary piping systems, install/remove blank flanges, install/remove temporary piping supports, perform fill and vent operations, install temporary external pumps and piping systems will require a substantial number of field support man-hours. Performing these field activities will result in a significant amount of accumulated radiation dose to steam generator replacement personnel."

"Applying the alternative pressure test and NDE permitted by Code Case N-416-2 to the selected Kewaunee replacement steam generator welds, accomplish the same purpose as a hydrostatic test. Like the basis for the other Code Class 1, 2, and 3 components discussed above, the code case and its associated NDE permit a leakage check at a slightly lower

pressure. The alternative test methods and NDE discussed in the code case result in overall reduced cost, and reduced accumulated personnel radiation dose, while still ensuring the quality and safety of the selected replacement steam generator welds. As stated in the NRC's evaluation of Code Case N-416-1 in Reference 2, hydrostatic pressure testing is primarily regarded as a means to enhance leakage detection during the examination of components under pressure, rather than solely as a measure to determine the structural integrity of the components. The industry indicates that experience has demonstrated that leaks are not being discovered as a result of hydrostatic test pressures propagating a preexisting flaw through wall. They indicate that leaks in most cases are being found when the system is at normal operating pressure. The above discussion and the NRC's evaluation of the earlier version of this code case directly support the basis of using Code Case N-416-2."

Licensee's Proposed Alternative Examination (as stated):

"Implement the criteria defined in items (a), (b), and (c) below as directly taken from Code Case N-416-2 "Alternative Pressure Test Requirement for Welded Repairs, Fabrication Welds for Replacement Parts and Piping Subassemblies, or Installation of Replacement Items by Welding, Class 1, 2, and 3 Section XI, Division 1."

"Additionally, KNPP proposes to continue to apply the additional NDE of Class 3 components, defined in (d) below, as approved by the NRC in Reference 2. Reference 2 summarizes the NRC's approval of Kewaunee's use of Code Case N-416-1."

"(a) NDE shall be performed on welded 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."

"(b) Prior to or immediately upon return to service, a visual examination (VT-2) shall be performed on welded repairs and fabrication and installation joints in conjunction with a system leakage test, using the 1992 Edition of Section XI, in accordance with para. IWA-5000, at nominal operating pressure and temperature."

"(c) Use of this Case shall be documented on an NIS-2 form."

"(d) The root (pass) layer of socket and butt welds on the pressure retaining boundary of Class 3 components shall be subject to either a surface examination or volumetric examination of the final weld at the owner's option."

3.2 NRC Staff Evaluation

ASME Section XI, 1989, IWA-4000(a) requires that a system hydrostatic test be performed in accordance with IWA-5000 after repairs by welding in a pressure-retaining boundary. The licensee proposes to implement the alternative to hydrostatic pressure tests contained in Code Case N-416-2 for Code Class 1, 2, and 3 repairs/replacements parts and piping subassemblies, or installation of replacement items. In addition, for Class 3 repair/replacement welds or welded areas, the licensee will supplement the pressure test with an additional surface examination on the root pass layer.

The licensee's steam generator replacement project will install two (2) SGLAs, refurbish and reuse the existing steam domes, and modify the steam generator support structures and connecting piping/instrumentation systems to accommodate the new SGLAs. Each SGLA is considered a Section III nuclear part. As such, each SGLA will be stamped with an ASME NPT stamp. The hydrostatic testing of NPT stamped parts installed as replacement items in N-stamped components is not required by the ASME Section III code.

The licensee originally specified a secondary side Section III shop hydrostatic test in the RSG Certified Design Specification. However, because the RSG fabrication schedule at Ansaldo Energia jeopardized the originally planned KNPP spring 2000 steam generator replacement outage, the licensee, in an effort to expedite the fabrication schedule, eliminated the secondary side hydrostatic pressure test from the design and fabrication specification. Continued fabrication schedule delays have caused the licensee to move the steam generator replacement outage to the fall 2001. As such, a Section III, shop-performed secondary side hydrostatic test will not be performed on the SGLAs. Ansaldo Energia, prior to shipment of the SGLAs to the Kewaunee plant, performed a successful shop Section III hydrostatic test on the primary side of each SGLA.

Also, ASME Section XI wording, prior to the 1999 ASME Code Addenda, only provides rules for the pressure testing of welded repairs and installation of items by welding (reference Section XI, IWA-4540 and Code Case N-416-1). Until the ASME approval of Code Case N-416-2, there was a gap between the published Construction Codes and Section XI, into which the requirement for pressure testing of fabrication welds fell. ASME Code Case N-416-2 clarifies acceptable pressure testing and NDE requirements for these fabrication welds. Code Case N-416-2 permits replacement part fabrication welds to be pressure tested along with the installation welds.

Hardships are generally encountered with the performance of hydrostatic testing in accordance with the Code. Hydrostatic pressure testing frequently requires a significant effort to set up and perform due to the need to use special equipment, such as temporary attachment of test pumps and gages, and the need for unique valve lineups.

Code Case N-416-2 specifies that NDE of the welds be performed in accordance with the applicable subsection of the 1992 Edition of Section III. Also, this Code Case allows a VT-2 visual examination to be performed at nominal operating pressure and temperature in conjunction with a system leakage test, in accordance with paragraph IWA-5000 of the 1992 Edition of Section XI. Comparison of the system pressure test requirements of the 1992 Edition of Section XI to those of the 1995 Edition through the 1996 Addenda of Section XI, the latest Code edition referenced in 10 CFR 50.55a, shows that:

1) The test frequencies and pressure conditions are unchanged;

2) The hold times either remained the same or increased;

3) The terminology associated with the system pressure test requirements for all three code classes has been clarified and streamlined; and

4) The NDE requirements for welded repairs remain the same.

Hydrostatic testing only subjects the piping components to a small increase in pressure over the design pressure and, therefore, does not present a significant challenge to pressure boundary integrity. Accordingly, hydrostatic pressure testing is primarily regarded as a means to enhance leak detection during the examination of components under pressure, rather than as a measure of the structural integrity of the components.

Following welding, the Code requires volumetric examination (depending on wall thickness) of repairs or replacements in Code Class I and 2 piping components, but only requires a surface examination of the final weld pass in Code Class 3 piping. There are no other NDE requirements for Code Class 3 components except for VT-2 visual examination for leaks in conjunction with the 10-year hydrostatic tests and the periodic pressure tests.

Considering the NDE performed on Code Class 1 and 2 systems, and considering that the hydrostatic pressure tests rarely result in pressure boundary leaks that would not occur during system leakage tests, the NRC staff believes that the increased assurance of the integrity of Class 1 and 2 welds that could be achieved is not commensurate with the burden of performing hydrostatic testing. It is also believed that the added assurance provided by a hydrostatic test

of Class 3 welds is not commensurate with the burden of hydrostatic testing when 1) a surface examination is performed on the root pass layer of butt and socket welds, and 2) a system pressure test is performed.

4.0 CONCLUSION

Compliance with Code hydrostatic testing requirements for welded repairs or replacements or piping subassemblies or installation of replacement of Code Class 1, 2, and 3 components, would result in a hardship without a compensating increase in the level of quality and safety. The licensee's proposed alternative provides reasonable assurance of structural integrity of the subject components. Therefore, the proposed alternative is authorized, pursuant to 10 CFR 50.55a(a)(3)(ii) for the third 10-year ISI interval or until such time as Code Case N-416-2 is referenced in 10 CFR 50.55a. At that time, if the licensee intends to continue to implement this code case, the licensee should follow all provisions referenced in Code Case N-416-2, with limitations identified in 10 CFR 50.55a, if any.

Principal Contributor: T. McLellan

Date: February 9, 2001