

January 19, 2005

Mr. Thomas Coutu  
Site Vice President  
Kewaunee Nuclear Power Plant  
Nuclear Management Company, LLC  
N490 Highway 42  
Kewaunee, WI 54216-9511

SUBJECT: KEWAUNEE NUCLEAR POWER PLANT - REQUEST FOR AUTHORIZATION TO  
USE CODE CASE N-661 (TAC NO. MC3878)

Dear Mr. Coutu:

By letter dated July 28, 2004, Nuclear Management Company, LLC (NMC, or the licensee), requested that the U. S. Nuclear Regulatory Commission (NRC) approve an alternative to the requirements of IWA-4221(a) and IWA-4221(b) of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code) Section XI, 1998 Edition with the 2000 Addenda. Specifically, the licensee requested that the NRC approve the use of ASME Code Case N-661, "Alternative Requirements for Wall Thickness Restoration of Class 2 and 3 Carbon Steel Piping for Raw Water Service." Kewaunee Nuclear Power Plant is committed to the 1998 Edition through the 2000 Addenda of Section XI of the ASME Code. The request was made pursuant to 10 CFR 50.55a(a)(3)(i) to address replacement or internal weld repair of wall thinning conditions resulting from various wall thinning degradation mechanisms such as erosion, corrosion, cavitation, and pitting in Class 2 and 3 carbon steel raw water piping systems.

Based on the information provided in the licensee's submittal, the NRC staff concludes that the licensee has provided an acceptable alternative to the requirements of IWA-4221(a) and IWA-4221(b) of the ASME Code Section XI, 1998 Edition with the 2000 Addenda, subject to the following three restrictions which must be met when using Code Case N-661. These restrictions, which the licensee has agreed to implement, are: (a) if the root cause of the degradation has not been determined, the repair is only acceptable for one cycle, (b) weld overlay repair of an area can only be performed once in the same location, and (c) when through-wall repairs are made by welding on surfaces that are wet or exposed to water, the weld overlay repair is only acceptable until the next refueling outage. The NRC staff concludes that the proposed alternative, as supplemented by the three restrictions listed above, provides an acceptable level of quality and safety. Therefore, the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the Kewaunee Nuclear Power Plant for the current 10-year inservice inspection (ISI) interval (fourth ISI interval, scheduled to end on June 16, 2014), or until Code Case N-661 is approved for general use by reference in Regulatory Guide (RG) 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1." After Code Case N-661 is published in a future version of RG 1.147, if the licensee intends to continue implementing Code Case N-661, the licensee must follow all provisions of Code Case N-661 with limitations or conditions specified in RG 1.147, if any. All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

T. Coutu

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The detailed results of the staff's review are provided in the enclosed safety evaluation. If you have any questions concerning this matter, please call Mr. F. Lyon of my staff at (301) 415-2296.

Sincerely,

**/RA/**

Margaret A. Kotzalas, Acting Chief, Section 1  
Project Directorate III  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-305

Enclosure: Safety Evaluation

cc w/encl: See next page

T. Coutu

-2-

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\*SE dated 12/7/04

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## SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

### AUTHORIZATION TO USE CODE CASE N-661

#### NUCLEAR MANAGEMENT COMPANY, LLC

#### KEWAUNEE NUCLEAR POWER PLANT

#### DOCKET NO. 50-305

### 1.0 INTRODUCTION

By letter dated July 28, 2004, Nuclear Management Company, LLC (NMC, or the licensee), requested that the U. S. Nuclear Regulatory Commission (NRC) approve an alternative to the requirements of IWA-4221(a) and IWA-4221(b) of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code) Section XI, 1998 Edition with the 2000 Addenda. Specifically, the licensee requested that the NRC approve the use of ASME Code Case N-661, "Alternative Requirements for Wall Thickness Restoration of Class 2 and 3 Carbon Steel Piping for Raw Water Service." Kewaunee Nuclear Power Plant is committed to the 1998 Edition through the 2000 Addenda of Section XI of the ASME Code. The request was made pursuant to 10 CFR 50.55a(a)(3)(i) to address replacement or internal weld repair of wall thinning conditions resulting from various wall thinning degradation mechanisms such as erosion, corrosion, cavitation, and pitting in Class 2 and 3 carbon steel raw water piping systems. The licensee stated the primary reason for the request was to provide adequate time for additional examination of adjacent piping so that pipe replacement can be planned to reduce impact on system availability, including Maintenance Rule applicability of replacement materials.

### 2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g) specifies that inservice inspection (ISI) of nuclear power plant components shall be performed in accordance with the requirements of the ASME Code, Section XI, 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 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. 10 CFR 50.55a(g)(5)(iii) states that 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, to support the determinations.

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 preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for

Inservice Inspection (ISI) of Nuclear Power Plant Components,” to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein.

#### ASME Code Components Affected

ASME Code Section XI, Class 2 and 3 Carbon Steel Piping for Raw Water Services

#### Applicable ASME Code Requirement

ASME Code Section XI, 1998 Edition with the 2000 Addenda:

IWA-4221(a) requires that items used for repair/replacement activities shall meet the applicable Owner’s Requirements.

IWA-4221(b) requires that an item to be used for repair/replacement activities shall meet the Construction Code specified in accordance with (1), (2), or (3) below.

- (1) When replacing an existing item, the new item shall meet the Construction Code to which the original item was constructed.
- (2) When adding a new item to an existing system, the Owner shall specify a Construction Code that is no earlier than the earliest Construction Code used for construction of any originally installed item in that system.
- (3) When adding a new system, the Owner shall specify a Construction Code that is no earlier than the earliest Construction Code used for other systems that perform a similar function.

IWA-4422.1(a) states that a defect is considered removed when it has been reduced to an acceptable size.

#### Reason for Request

Relief is requested from replacement or weld repair of wall thinning conditions in Class 2 and 3 carbon steel raw water piping systems to the design specification and the original construction code. The wall thinning conditions may be the result of various degradation mechanisms such as erosion, corrosion, cavitation, and pitting. The licensee stated the primary reason for this relief request is to provide adequate time so that pipe replacement can be planned to reduce impact on system availability, including Maintenance Rule applicability of replacement materials.

#### Proposed Alternative and Basis for Use

The licensee will implement the requirements of ASME Code Case N-661 as an alternative under 10 CFR 50.55a(a)(3)(i) to the requirements of ASME Code Section XI referenced above

for Class 2 and 3 raw water piping system repairs resulting from degradation mechanisms such as erosion, corrosion, cavitation, or pitting as an alternative. The licensee stated that these types of defects are typically identified by small leaks in the piping system or by pre-emptive non-code required examinations performed to monitor the degradation mechanisms. The alternative repair technique described in Code Case N-661 involves the application of additional weld metal on the exterior of the piping system that restores the wall thickness requirement. The licensee stated that the repair technique will be utilized whenever the engineering evaluation determines that such a repair is suitable for the particular defect or degradation being resolved. The licensee stated that provisions for use of this Code Case will be addressed in the Repair/Replacement Program for the Kewaunee Nuclear Power Plant.

The licensee stated that the provisions will require that adjacent areas be examined to verify that the repair will encompass the entire flawed area and that no other unacceptable degraded locations exist within a representative area dependent on the degradation mechanism present. The licensee will perform an evaluation of the degradation mechanism to determine the re-examination schedule to be performed over the life of the repair. The repair will be considered to have a maximum service life of two fuel cycles unless the re-examinations conducted during each of the two fuel cycles establish the expected life of the repair.

Additionally, the licensee stated the following restrictions will be placed on the use of Code Case N-661, to ensure that the use of the Code Case will provide an acceptable alternative pursuant to 10 CFR 50.55a(a)(3)(i):

- (a) If the root cause of the degradation has not been determined, the repair is only acceptable for one cycle,
- (b) Weld overlay repair of an area can only be performed once in the same location, and
- (c) when through-wall repairs are made by welding on surfaces that are wet or exposed to water, the weld overlay repair is only acceptable until the next refueling outage.

The basis for use of the repair technique described in Code Case N-661 is that the ASME Code subcommittee for Section XI determined that this repair technique provides an acceptable alternative to the requirements of IWA-4000 and provides an acceptable level of quality and safety. Therefore, the proposed alternative is justified per 10 CFR 50.55a(a)(3)(i).

Code Case N-661 was approved by the ASME Section XI Code Committee on July 23, 2002; however, it has not been incorporated into NRC Regulatory Guide (RG) 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI Division 1," and thus is not available for application at nuclear power plants without specific NRC approval. Therefore, NMC is requesting use of the alternative repair technique described via this relief request.

#### Duration of Proposed Alternative

The licensee requested authorization of Code Case N-661 to be used for the Kewaunee Nuclear Power Plant's current 10-year ISI interval or until the NRC publishes Code Case N-661 in a future revision of RG 1.147. Upon incorporation into the RG, the licensee stated they will

review and follow the conditions specified. The licensee also stated that all other ASME Code, Section XI requirements for which relief was not specifically requested and authorized by the NRC staff will remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

### Staff Evaluation

The licensee is proposing to use the provisions of Code Case N-661 to perform an alternative repair of degraded components which involve the application of weld metal overlay on the exterior of the piping system to restore the wall thickness of the component. The licensee stated that this repair technique will be utilized whenever engineering evaluations determine that such a repair is suitable for the particular defect or degradation being resolved. Provisions for use of this Code Case will be addressed in the licensee's Repair/Replacement Program. The licensee stated that those provisions will require that adjacent areas be examined to verify that the entire flawed area will be encompassed by the repair and that there are no other unacceptable degraded locations within a representative area dependent on the degradation mechanism present. An evaluation of the degradation mechanism will be performed by the licensee to determine the re-examination schedule to be performed over the life of the repair. The licensee stated the repair will be considered to have a maximum service life of two fuel cycles unless examinations during each of the two fuel cycles are performed to establish the expected life of the repair.

The NRC staff finds the licensee's reasoning in support of its request for relief acceptable. This finding is based on the fact that the NRC staff has reviewed Code Case N-661 for inclusion in RG 1.147. The NRC staff's review of Code Case N-661 established three restrictions that the licensee agreed to place on the use of Code Case N-661 to assure that the Code Case will provide an acceptable alternative pursuant to 10 CFR 50.55a(a)(3)(i). These restrictions are:

- (a) If the root cause of the degradation has not been determined, the repair is only acceptable for one cycle,
- (b) Weld overlay repair of an area can only be performed once in the same location, and
- (c) When through-wall repairs are made by welding on surfaces that are wet or exposed to water, the weld overlay is only acceptable until the next refueling outage.

The NRC staff established these three restrictions based on the following considerations:

- (a) If the root cause of the degradation has not been determined, a suitable reinspection frequency cannot be established.
- (b) Weld overlay repair of an area can only be performed once to ensure that ineffective repairs are not being repeatedly implemented in the same location.
- (c) Performing through-wall weld repairs on surfaces that are wet or exposed to water would produce welds that include weld defects such as porosity, lack of fusion, and cracks. It is highly unlikely that a weld can be made on an open root joint with



water present on the backside of the weld without having several weld defects. These types of weld defects can, and many times do, lead to premature failure of a weld joint.

### 3.0 CONCLUSION

Based on the information provided in the licensee's submittal, the NRC staff concludes that the licensee has provided an acceptable alternative to the requirements of IWA-4221(a) and IWA-4221(b) of the ASME Code Section XI, 1998 Edition with the 2000 Addenda, subject to the following three restrictions which must be met when using Code Case N-661. These restrictions are: (a) if the root cause of the degradation has not been determined, the repair is only acceptable for one cycle, (b) weld overlay repair of an area can only be performed once in the same location, and (c) when through-wall repairs are made by welding on surfaces that are wet or exposed to water, the weld overlay repair is only acceptable until the next refueling outage. The NRC staff concludes that the proposed alternative, as supplemented by the three restrictions listed above, provides an acceptable level of quality and safety. Therefore, the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for Kewaunee Nuclear Power Plant for the current 10-year ISI interval (fourth ISI interval, scheduled to end on June 16, 2014), or until Code Case N-661 is approved for general use by reference in RG 1.147. After Code Case N-661 is published in a future version of RG 1.147, if the licensee intends to continue implementing Code Case N-661, the licensee must follow all provisions of Code Case N-661 with limitations or conditions specified in RG 1.147, if any. All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Eric Reichelt

Date: January 19, 2005