April 3, 2006

Mr. Paul A. Harden
Site Vice President
Nuclear Management Company, LLC
Palisades Nuclear Plant
27780 Blue Star Memorial Highway
Covert, MI 49043-9530

SUBJECT: PALISADES NUCLEAR PLANT — REQUEST FOR AUTHORIZATION TO USE ALTERNATIVES TO ASME CODE, SECTION XI, IWA-4120 FOR REACTOR PRESSURE VESSEL HEAD PENETRATION REPAIR (TAC NO. MC8603)

Dear Mr. Harden:

Your letter of October 11, 2005, submitted two requests for relief from certain sections of the American Society of Mechanical Engineers *Boiler and Pressure Vessel Code* (ASME Code), Section XI, 1989 Edition, for reactor vessel closure head (RVCH) penetration repair. Specifically, Relief Request No. 1 pertained to ASME Code, Section XI, IWA-4120, "Rules and Requirements." Relief Request No. 2 was concerned with ASME Code, Section XI, IWA-3300, "Flaw Characterization," IWB-3142.4, "Acceptance by Analytical Evaluation," IWB-3420, "Characterization," and IWB-3613, "Acceptance Criteria for Flanges and Shell Regions Near Structural Discontinuities." This authorization pertains to Relief Request No. 1. Relief Request No. 2 will be handled under separate correspondence.

Relief Request No. 1, submitted in your letter of October 11, 2005, as supplemented February 27, 2006, pertains to the repair of the control rod drive nozzles and incore instrumentation nozzles on the RVCH at Palisades. On November 8, 2004, NMC received Nuclear Regulatory Commission (NRC) approval for repair of the control rod drive and incore instrumentation nozzles during the current 10-year inservice inspection interval, but has subsequently made changes to the repair method. This request seeks approval of a revised nozzle-repair method. NMC is inspecting the RVCH, control rod drive nozzle penetrations, and incore instrumentation nozzle penetrations during the spring 2006 refueling outage at Palisades in accordance with NRC Order, EA-03-009. NMC submitted this request in the event that a RVCH nozzle penetration requires repair.

We have completed our review of Relief Request No. 1, and conclude that your proposed alternatives to flaw repair and inspection for the control rod drive and incore instrumentation nozzles of the RVCH provide an acceptable level of quality and safety. Therefore, pursuant to

Title 10 of the *Code of Federal Regulations* 50.55a(a)(3)(i), the NRC staff authorizes the proposed alternatives through the end of the third 10-year inservice inspection interval at Palisades. Enclosed is our safety evaluation.

Sincerely,

/RA/

L. Raghavan, Branch Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-255

Enclosure:
Safety Evaluation

cc w/encl: See next page

Title 10 of the *Code of Federal Regulations* 50.55a(a)(3)(i), the NRC staff authorizes the proposed alternatives through the end of the third 10-year inservice inspection interval at Palisades. Enclosed is our safety evaluation.

Sincerely,

/RA/

L. Raghavan, Branch Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-255

Enclosure:
Safety Evaluation

cc w/encl: See next page

DISTRIBUTION:

PUBLIC	LPLIII-1 R/F	RidsNrrPMMPadovan	RidsNrrLATHarris
RidsNrrDorlLple	RidsOgcRp	RidsAcrsAcnwMailCenter	RidsNrrDorlDpr
RidsNrrDciCpnb	DWeaver	RDavis	CLipa, RGN-III

Jennifer Dixon-Herrity, RIII
ADAMS Accession Number: **ML060800319**

OFFICE	NRR/LPL3-1/PM	NRR/LPL3-1/LA	DCI/CPNB	OGC	NRR/LPL3-1/BC
NAME	MPadovan	THarris	TChan	SUttal	LRaghavan
DATE	03/23/06	03/22/06	03/31/06	03/31/06	04/3/06

OFFICIAL RECORD COPY

Palisades Plant

cc:

Robert A. Fenech, Senior Vice President
Nuclear, Fossil, and Hydro Operations
Consumers Energy Company
1945 Parnall Rd.
Jackson, MI 49201

Arunas T. Udrys, Esquire
Consumers Energy Company
1 Energy Plaza
Jackson, MI 49201

Regional Administrator, Region III
U.S. Nuclear Regulatory Commission
801 Warrenville Road
Lisle, IL 60532-4351

Supervisor
Covert Township
P. O. Box 35
Covert, MI 49043

Office of the Governor
P. O. Box 30013
Lansing, MI 48909

U.S. Nuclear Regulatory Commission
Resident Inspector's Office
Palisades Plant
27782 Blue Star Memorial Highway
Covert, MI 49043

Michigan Department of Environmental Quality
Waste and Hazardous Materials Division
Hazardous Waste and Radiological
Protection Section
Nuclear Facilities Unit
Constitution Hall, Lower-Level North
525 West Allegan Street
P.O. Box 30241
Lansing, MI 48909-7741

Michigan Department of Attorney General
Special Litigation Division
525 West Ottawa St.
Sixth Floor, G. Mennen Williams Building
Lansing, MI 48913

John Paul Cowan
Executive Vice President & Chief Nuclear
Officer
Nuclear Management Company, LLC
700 First Street
Hudson, WI 54016

Jonathan Rogoff, Esquire
Vice President, Counsel & Secretary
Nuclear Management Company, LLC
700 First Street
Hudson, WI 54016

Douglas E. Cooper
Senior Vice President - Group Operations
Palisades Nuclear Plant
Nuclear Management Company, LLC
27780 Blue Star Memorial Highway
Covert, MI 49043

Stephen T. Wawro, Director
of Nuclear Assets
Consumers Energy Company
Palisades Nuclear Plant
27780 Blue Star Memorial Highway
Covert, MI 49043

Laurie A. Lahti, Manager
Regulatory Affairs
Nuclear Management Company, LLC
Palisades Nuclear Plant
27780 Blue Star Memorial Highway
Covert, MI 49043

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR AUTHORIZATION TO USE ALTERNATIVES TO

ASME CODE, SECTION XI, IWA-4120

FOR REACTOR PRESSURE VESSEL HEAD PENETRATION REPAIR

NUCLEAR MANAGEMENT COMPANY

PALISADES NUCLEAR PLANT

DOCKET NO. 50-255

1.0 INTRODUCTION

Nuclear Management Company, LLC's (NMC) letter of October 11, 2005, submitted two requests for relief from certain sections of the American Society of Mechanical Engineers *Boiler and Pressure Vessel Code* (ASME Code), Section XI, 1989 Edition, for reactor vessel closure head (RVCH) penetration repair. Specifically, Relief Request No. 1 pertained to ASME Code, Section XI, IWA-4120, "Rules and Requirements." Relief Request No. 2 was concerned with ASME Code, Section XI, IWA-3300, "Flaw Characterization," IWB-3142.4, "Acceptance by Analytical Evaluation," IWB-3420, "Characterization," and IWB-3613, "Acceptance Criteria for Flanges and Shell Regions Near Structural Discontinuities." This authorization pertains to Relief Request No. 1.

Relief Request No. 1, submitted in NMC's letter of October 11, 2005, as supplemented February 27, 2006, pertains to the repair of the control rod drive (CRD) nozzles and incore instrumentation (ICI) nozzles on the RVCH at Palisades. On November 8, 2004, NMC received Nuclear Regulatory Commission (NRC) approval for repair of the CRD and ICI nozzles during the current 10-year inservice inspection (ISI) interval, but has subsequently made changes to the repair method. This request seeks approval of a revised nozzle-repair method. NMC is inspecting the RVCH, CRD nozzle penetrations, and ICI nozzle penetrations during the spring 2006 refueling outage at Palisades in accordance with NRC Order, EA-03-009, "Issuance of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors," dated February 20, 2004. NMC submitted this request in the event that a RVCH nozzle penetration requires repair.

2.0 REGULATORY EVALUATION

The ISI of ASME Code Class 1, Class 2, and Class 3 components is to be performed in accordance with the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," and applicable edition and 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

Commission pursuant to 10 CFR 50.55a(g)(6)(i). Paragraph 10 CFR 50.55a(a)(3) states, in part, that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the applicant demonstrates that: (i) the proposed alternatives would provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) will meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, to the extent practical within the limitations of design, geometry, and materials of construction of the components. Paragraph 10 CFR 50.55a(g)(4) requires that inservice examination of components and system pressure tests conducted during the first 10-year inspection interval, and subsequent inspection intervals, comply with the requirements in the latest edition and addenda of Section XI of the ASME Code. The latest edition and addenda of Section XI of the ASME Code is incorporated by reference in 10 CFR 50.55a(b), 12-months prior to the start of the 10-year inspection interval.

The original construction code for the Palisades Nuclear Plant is ASME Code, Section III, 1965 Edition, including addenda through winter 1965. The ISI code of record for the third 10-year interval is the 1989 Edition of ASME Code, Section XI, no addenda.

3.0 TECHNICAL EVALUATION

3.1 Components for Which Relief Is Requested

The components for which relief is requested are the RVCH, 45 CRD nozzle penetrations, and 8 ICI nozzle penetrations.

3.2 Applicable ASME Code Edition and Addenda

The applicable code edition and addenda applicable to the proposed repairs is the 1989 Edition of the ASME Code, Section XI, with no addenda.

3.3 Applicable ASME Code Requirement

The applicable code requirement for RVCH penetration repair is ASME Code, Section XI, IWA-4120, “Rules and Requirements.” Paragraph IWA-4120 specifies the following:

(a) Repairs shall be performed in accordance with the owner's design specification and the original construction code of the component or system. Later edition and addenda of the construction code or of Section III, either in their entirety or portions thereof, and code cases may be used. If repair welding cannot be performed in accordance with these requirements, the applicable alternative requirements, of IWA-4500 and the following may be used:

(1) IWB-4000 for Class 1 components;
(2) IWC-4000 for Class 2 components;
(3) IWD-4000 for Class 3 components;

(4) IWE-4000 for Class MC components; or
(5) IWF-4000 for component supports.

(b) The edition and addenda of Section XI used for the repair program shall correspond with the edition and addenda identified in the ISI program applicable to the inspection interval.

(c) Later editions and addenda of Section XI, either in their entirety or portions thereof, may be used for the repair program, provided these editions and addenda of Section XI at the time of the planned repair have been incorporated by reference in amended regulations of the regulatory authority having jurisdiction at the plant site.

3.4 NMC's Proposed Alternatives

NMC requested relief to use a welding-repair method using an ambient-temperature temper bead as an alternative to the requirements of the 1989 Edition of the ASME Code, Section III, NB-4453, NB-4622, NB-5245, and NB-5330. Approval is requested to use filler material, Alloy 52 American Welding Society Class ERNiCrFe-7/UNS No. 06052, which is endorsed by Code Case 2142-1, "F-Number Grouping for Ni-Cr-Fe, Classification UNC N06052 Filler Material," for the weld repair. Portions of Code Case N-638, "Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW [Gas Tungsten Arc Welding] Temper Bead Technique," which has been approved in Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability - ASME Section XI Division 1," Revision 13, was used as a template for NMC's proposed repair.

As an alternative to ASME Code requirements, NMC will use the welding technique as discussed in its submittal of October 11, 2005, as supplemented February 27, 2006. It is not feasible to apply the post-weld heat treatment requirements of paragraph NB-4622 of the 1989 ASME Code, Section III, to the RVCH, or the elevated temperature preheat and post weld soak required by the alternative temper bead method offered by ASME Code, Section XI, IWA-4500. This is because of the risk of damage to the RVCH material properties or dimensions, and the additional radiological dose that would be required. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), NMC requests relief to use an ambient temperature temper bead welding method as an alternative to the welding requirements of ASME Section III, NB-4622,1989 Edition, no addenda.

NMC proposed the following alternatives to the specific sections of the ASME Code, Sections III, IX, and XI requirements:

— The following sections of ASME Section III or portions thereof do not apply to the licensee's proposed alternative and will not be met: NB-4622.1, NB-4622.2, NB-4622.3, NB-4622.4, NB-4622.5, NB-4622.6, NB-4622.7, NB-4622.8, NB-4622.9, NB-4622.10, NB-4622.11(c), NB-4622.11(f), NB-4622.11(d)(1), NB-4622.11(d)(2), NB-4622.11(d)(3), NB-4622.11(g), NB-4453.4, NB-5330(b). These sections are identical to those that NMC did not meet in its last request.

— NB-4622.11(e) establishes the requirements for documentation of the weld repairs in accordance with NB-4130. The proposed alternative will comply with the requirement.

— QW-256 of ASME Code, Section IX, or portions thereof, do not apply to NMC's proposed alternative and will not be met.

NMC's repair method uses ASME Code, Section XI, Code Case N–638 as a guide with exception to the following sections: 2.1(b), 2.1(c), 2.1(h), 3.0(c), 3.0(d), 3.0(e), 4.0(b), 4.0(c), and 4.0(e), which will not be met.

N-638 2.1(j) requires the three heat affected zones (HAZ) impact tests be equal or greater than the unaffected base material tests. During the Charpy impact testing portion of the qualification process, the reference temperature (RT_{NDT}) was determined to be -30 degrees F. At RT_{NDT} + 60 degrees F temperature (+30 degrees F), the average of the HAZ absorbed energy Charpy impact tests was greater than the average of the unaffected base material. However, the average of the mils lateral expansion for the HAZ was less than the average values for the unaffected base material. Additional Charpy V-notch tests were conducted on the HAZ material as permitted by NB-4335.2 to determine an additive temperature to the RT_{NDT} temperature. The average mils lateral expansion for the HAZ at +35 degrees F was equivalent to the unaffected base material at +30 degrees F. These test results require an adjustment temperature of +5 degrees F to the RT_{NDT} temperature for base material on which welding is performed.

3.5 NMC's Basis for the Proposed Alternatives

NMC's basis for its alternative is documented in its October 11, 2005, submittal as supplemented February 27, 2006. Features of the alternative repair technique that NMC believes make it applicable and acceptable for the potential repairs are almost identical to those described in its repair alternative that was approved by the NRC on November 4, 2004. The major difference in NMC's current request is that NMC intends to not perform the abrasive water-jet machining (AWJM) conditioning technique on completed repair welds. NMC's alternative to ASME Code Case N- 638, Section 2.1(j), is also different from its previous request.

During the 2004 refueling outage, repairs were performed on two CRD nozzles using an alternate inner diameter temper bead (IDTB) weld repair. A part of this repair required using the AWJM conditioning technique. NMC stated that it has evaluated the need to perform this AWJM conditioning during repairs that may be necessary during the 2006 refueling outage. This evaluation considered the CRD and ICI nozzles in the as-repaired condition, and encompassed initiation and crack growth due to primary water stress corrosion cracking. Framatome ANP (FANP) performed an analysis of a non-AWJM conditioned repair, and determined that a crack will not grow to 75 percent through-wall within 5.04 effective full power years (EFPY) for a repaired CRD nozzle, and 5.13 EFPY for a repaired ICI nozzle. These times are beyond the duration for the relief request, and therefore AWJM conditioning has been determined to be unnecessary in the repair process. NMC's alternative to the required Code Case N-638, Section 2.1 (j), HAZ impact testing uses alternative impact testing requirements of the Construction Code which the NMC believes provides an acceptable level of quality and safety.

3.6 Duration of Proposed Alternative

NMC requests approval of the proposed alternative for the remainder of the third 10-year interval of the ISI Program for Palisades Nuclear Plant, which will conclude on or before December 12, 2006.

3.7 Staff Evaluation

NMC received approval from the NRC for an alternative technique to repair the Palisades Nuclear Plant (PNP) reactor pressure vessel head penetrations for the remainder of its third 10-year ISI interval. NMC's alternative was approved by the NRC's letter of November 8, 2004. This letter contains approval for Relief Request No. 1, "Alternative Repair Technique for Reactor Vessel Head Penetrations," and Relief Request No. 2, "Flaw Characterization of Remnant Weld." NMC's October 11, 2005, submittal, as supplemented February 27, 2006, contains two similar relief requests. This safety evaluation pertains to Relief Request No. 1 of the October 11, 2005 request. Relief Request No. 2 is being reviewed under a separate cover.

The NRC staff reviewed NMC's alternatives to the ASME Code requirements for ASME Code, Section III, NB-4622.1 through NB-4622.11, NB-4453.4, and NB-5330(b); ASME Code, Section IX, QW-256; and ASME Code Case N–638, Sections 2.1(b), 2.1(c), 2.1(h), 3.0(c), 3.0(d), 3.0(e), 4.0(b), 4.0(c), and 4.0(e). NMC's alternatives to the above requirements are the same as those for the NRC-approved alternative repair technique already approved for PNP for the current 10-year ISI interval. Given that the differences in NMC's alternative discussed below do not have an impact on the NRC staff's previous evaluation of the aforementioned alternatives, the NRC staff finds this acceptable.

NMC's previous request did not indicate that it intended to deviate from the requirements of Code Case N-638 2.1(j), which applies to HAZ impact testing. However, the current request does not follow N-638 2.1(j). N-638 2.1(j) requires the three HAZ impact tests be equal or greater than the unaffected base material tests. During the Charpy impact testing portion of the qualification process, the reference temperature (RT_{NDT}) was determined to be - 30 degrees F. At RT_{NDT} + 60 degrees F temperature (+30 degrees F), the average of the HAZ absorbed energy Charpy impact tests was greater than the average of the unaffected base material, which is acceptable per the Code Case. However, the average of the mils lateral expansion for the HAZ was less than the average values for the unaffected base material. NMC stated that additional Charpy V-notch tests were conducted on the HAZ material, as permitted by NB-4335.2, to determine an additive temperature to the RT_{NDT} temperature. The average mils lateral expansion for the HAZ at +35 degrees F was equivalent to the unaffected base material at +30 degrees F. As a result, NMC performed the required adjustment temperature of +5 degrees F to the RT_{NDT} temperature for base material on which welding is performed. The NRC staff asked NMC to confirm that it met all requirements of NB-4335.2. NMC's letter of February 27, 2006, stated that the requirements for impact testing of the HAZ as described in NB-4335.2 have been met. The NRC staff finds the proposed alternative acceptable because it meets the construction code requirements.

In its submittal of August 2, 2004, related to its request which the NRC staff previously approved, NMC stated that if the IDTB weld repair is not AWJM remediated, the life expectancy relative to primary water stress-corrosion cracking (PWSCC) is estimated at 1.3 EFPY for a CRD nozzle and 1.5 EFPY for an ICI nozzle for a postulated crack in the repaired nozzle to

reach to the ASME limit of 75 percent through-wall. If AWJM is used, the life expectancy of the repaired nozzle is estimated at 53 EFPY for the CRD and ICI nozzles. Based on that assessment, NMC included AWJM conditioning as part of the original repair procedures. In its submittal of October 11, 2005, NMC stated that if the AWJM conditioning is not used, the life expectancy of the IDTB weld repair relative to PWSCC is estimated at 5.04 EFPY for a CRD nozzle, and 5.13 EFPY for an ICI nozzle.

By letter dated February 1, 2006, the NRC staff asked NMC to explain the change in the current method used to analyze the life expectancy of non-AWJM versus the method used in the previous relief request.

In its letter of February 27, 2006, NMC responded that the method used in its August 2, 2004, submittal was a conservative, simplistic, life assessment of a non-remediation modification. This assessment was for comparative and informative purposes. The method considered immediate PWSCC crack initiation, ASME Code, Section XI, acceptance criteria, and a constant rapid crack growth rate independent of stress intensity (Ki). In the October 2005 submittal, the method used was quantitative and considered immediate PWSCC crack initiation, weld residual and operating throughwall stress distributions, ASME Code, Section XI, acceptance criteria, and Ki based on crack growth using MRP-55, Revision 01, Alloy 600 crack growth rates. With a realistic calculation, NMC obtained a time of 5.04 EFPY compared to the earlier 1.3 EFPY assessment for the control rod drive mechanism (CRDM) nozzle. In accordance with NRC Order EA-03-009, any repaired/modified CRDM nozzle is required to be inspected at every refueling outage. The Palisades' refueling outage is approximately every 18 months. The inspection will be able to detect any crack which develops during the 18-month period. This means that any potential crack should be detected, and NMC would take corrective actions before the crack reaches the ASME Code limit of 75-percent through wall. The NRC staff finds that NMC has demonstrated that AWJM is not needed because there is sufficient time between periodic inspections to detect any potential flaws occurring in the repaired nozzle before the crack reaches the limit of 75-percent through-wall. On the basis of NMC's stress analyses and flaw evaluation, the NRC staff finds that the new repair weld satisfies the requirements of ASME Sections III and XI, and reasonable assurance of structural integrity will be provided.

4.0 CONCLUSION

On the basis of the NRC staff's previous evaluation of November 4, 2004, and the NRC staff's current evaluation, the NRC staff concludes that NMC's proposed alternatives to flaw repair and inspection for the CRD nozzles and ICI nozzles of the RVCH provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff authorizes the proposed alternatives for the repair of the CRD nozzles and ICI nozzles of the RVCH through the end of the third 10-year ISI interval at the PNP.

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

Principal Contributor: R. Davis

Date: April 3, 2006