August 7, 2003

Mr. David L. Wilson
Site Vice President
Monticello Nuclear Generating Plant
Nuclear Management Company, LLC
2807 West County Road 75
Monticello, MN 55362-9637

SUBJECT: MONTICELLO NUCLEAR GENERATING PLANT — EVALUATION OF RELIEF REQUEST NO. PR-06 RELATED TO THE FOURTH 10-YEAR INTERVAL INSERVICE TESTING PROGRAM (TAC NO. MB9550)

Dear Mr. Wilson:

The Nuclear Management Company, LLC's (NMC's) letter of May 6, 2003, as supplemented July 22, 2003, submitted pump Relief Request No. PR-06 to the Nuclear Regulatory Commission (NRC) requesting relief from certain requirements of the American Society of Mechanical Engineers *Code for Operation and Maintenance of Nuclear Power Plants*. This request applies to the fourth 10-year interval of the inservice testing (IST) plan for the Monticello Nuclear Generating Plant.

The NRC staff evaluated NMC's request to use reference curves as part of an alternative methodology for testing high-pressure coolant injection (HPCI) pump P-209. The NRC staff concludes that NMC's proposed alternative provides an acceptable level of quality and safety. Accordingly, the NRC staff authorizes NMC's proposed alternative testing methodology for HPCI pump P-209 at Monticello in accordance with 10 CFR 50.55a(a)(3)(i). This relief is authorized for the fourth 10-year IST plan interval at Monticello.

Enclosed is our safety evaluation.

Sincerely,

/RA/

L. Raghavan, Chief, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-263

Enclosure: Safety Evaluation

cc w/encl: See next page

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Monticello Nuclear Generating Plant

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST NO. PR-06 RELATED TO THE

FOURTH 10-YEAR INSERVICE TESTING PROGRAM

NUCLEAR MANAGEMENT COMPANY, LLC

MONTICELLO NUCLEAR GENERATING PLANT

DOCKET NO. 50-263

1.0 INTRODUCTION

The Nuclear Management Company, LLC's (NMC's), letter of May 6, 2003, as supplemented July 22, 2003, submitted pump Relief Request No. PR-06 to the Nuclear Regulatory Commission (NRC) requesting relief from certain requirements of the American Society of Mechanical Engineers *Code for Operation and Maintenance of Nuclear Power Plants* (ASME OM Code). This request applies to the fourth 10-year interval of the inservice testing (IST) plan for the Monticello Nuclear Generating Plant (MNGP). In PR-06, NMC proposed to establish and use reference curves as part of the Group B and Comprehensive tests of high-pressure coolant injection (HPCI) pump P-209 in the IST program at MNGP.

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a, requires that IST of certain ASME Code Class 1, 2, and 3 pumps and valves be performed in accordance with the ASME OM Code and applicable addenda, except where alternatives have been authorized or relief has been requested by the licensee and granted by the Commission pursuant to 10 CFR 50.55a(a)(3)(i), 10 CFR 50.55a(a)(3)(ii), or 10 CFR 50.55a(f)(6)(i). In proposing alternatives or requesting relief, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety; (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for the facility. The Commission may approve alternatives and grant relief from ASME Code requirements upon making necessary findings. NRC guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provides alternatives to ASME Code requirements which are acceptable. Further guidance is given in GL 89-04, Supplement 1, and NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants."

ENCLOSURE

NMC is required to meet the requirements of the 1995 edition including the 1996 addenda of the ASME OM Code for pump and valve IST for its fourth 10-year IST interval program. Subsection ISTB, "Inservice Testing of Pumps in Light-Water Reactor Power Plants," of the ASME OM Code provides the requirements for IST of pumps. Monticello's fourth 10-year IST interval began June 1, 2003, and ends May 31, 2012.

3.0 TECHNICAL EVALUATION

3.1 ASME OM Code Requirements

In accordance with the 1995 edition and 1996 addenda of the ASME OM Code, NMC has categorized HPCI pump P-209 at MNGP as Group B based on its use in a standby system that is not operated routinely except for testing. As incorporated by reference in the NRC regulations, paragraph ISTB 5.1 of the ASME OM Code requires that HPCI pumps undergo a Group B test quarterly and a Comprehensive test biennially. The applicable portions of paragraphs ISTB 5.2.2(a) and ISTB 5.2.3(a) require that the Group B and Comprehensive tests for an HPCI pump be conducted with the pump operated at a speed adjusted to the reference point (± 1 percent). With respect to the Group B test, paragraph ISTB 5.2.2(c) specifies that system resistance may be varied as necessary to achieve the reference point. For the Comprehensive test, paragraph ISTB 5.2.3(b) states, in part, that the resistance of the system shall be varied until the flow rate equals the reference point, and that the differential pressure shall then be determined and compared to its reference value.

3.2 NMC's Basis for Relief

NMC's letter of May 6, 2003, states that using an accurate reference value is very important in order to perform accurate trending and data analysis. NMC has determined that the complexities of the flow control system for HPCI pump P-209 at MNGP make it difficult to exactly duplicate the reference points. NMC is also concerned that iterative manipulation of the control system to refine the hydraulic and speed parameters contributes additional wear to system components. The licensee considers that the alternative test method being proposed for the Group B and Comprehensive tests of the HPCI pump at MNGP will provide an acceptable level of quality and safety.

3.3 NMC's Proposed Alternative (as stated)

> Alternative testing is requested to be authorized in accordance with 10 CFR 50.55a(a)(3)(i). The proposed alternative testing described below provides an acceptable level of quality and safety based upon an increased accuracy in trending and data analysis. The methodology utilized follows the guidelines in Code Case OMN-9, "Use of a Pump Curve for Testing."
>
> Pump Testing Performed
>
> The NMC performed a pump performance test on the MNGP HPC pump on February 12, 2003 to gather flow, pressure, speed and vibration data over a range of flow rates while the pump condition was known to be operating acceptably. During this test, pump driver speed was held nominally constant near the reference speed for the duration of the test. Prior to taking data at the test points, HPC pump operation was

stabilized (nominally two minutes). Data sets were obtained and the methodology prescribed in Code Case OMN-9 was utilized (Tables 1 and 2 and Figures 1 and 2 [in NMC's letter of May 6, 2003]).

Pump flow and differential pressure test data was found to follow the expected 3rd order polynomial curve, which is characteristic of centrifugal pump operation.

During testing, vibration data was taken over an enveloping flow range. Figure 3 through Figure 6 [in NMC's letter of May 6, 2003] are provided to show that there is no significant variation in vibration readings over the anticipated allowable flow range. The anticipated allowable flow range is planned to be used during Quarterly (Group B) and Comprehensive (Biennial) testing for the HPC pump.

In summary, the overall results of the test indicate the pump operates acceptably with no unexpected anomalies over the range of testing performed. The findings are similar to those concluded by the Duane Arnold Energy Center (DAEC) in their HPC Relief Request PR-04, which is currently approved for their Inservice Testing (IST) 3rd ten-year code interval.

Technical Description of Method

The method of obtaining a reference value curve was established using Code Case OMN-9 as a guideline and is similar to DAEC Relief Request PR-04. In the MNGP HPC pump testing the NMC produced flow, vibration, pressure and speed data points over an operating range that exceeded that which was necessary to establish the IST allowable pump flow band. As described in this relief request, five data sets (each data set consisted of two readings for flow, pressure, speed and vibration) were analyzed in the development of the pump reference curve. The data sets are distributed across the entire range of potential in-service test conditions.

The reference value curve is computed using a third order polynomial regression technique that employs a least squares fit of the data points. The resulting reference value curve is a third order polynomial in the general form of:

$$y = a_3x^3 + a_2x^2 + a_1x + a_0$$

where: y = dependent variable (psid) [pounds per square inch differential]
x = independent variable (gpm) [gallons per minute]
a_i = constants

The Required Action and Alert Range limits are scalar multiples of the reference value curve. Tabular summaries are used as Acceptance Criteria to evaluate the test results (Table 1 and Table 2 [in NMC's letter of May 6, 2003]).

The measurements taken during the test were then analyzed to define the boundaries of the reference value curve. For future surveillance testing, the test differential pressure vs. flow will be plotted on the reference value curve included in the permanent test records. An example of the curve to be used in the permanent test records is shown in Figure 1 and Figure 2 [in NMC's letter of May 6, 2003]. For determination of whether

the IST Acceptance Criteria is met, Table 1 and Table 2 [in NMC's letter of May 6, 2003] will be utilized to analyze the data.

Alternative Testing

During Comprehensive and Quarterly HPC Pump Testing, pump differential pressure and flow rate will be evaluated using a reference point derived from a pump curve. Figure 1 and Figure 2 [in NMC's letter of May 6, 2003] provide the representative graph that NMC proposes to use for Quarterly and Comprehensive Testing, respectively. The reference point test pump curve will be restricted to an operating range that is representative of accident conditions. Appropriate upper and lower acceptance criteria limits for differential pressure will be established for the Required Action and Alert range limits, as applicable, for Group B (Quarterly) and Comprehensive testing. These limits will be scalar multiples of the reference pump curve. For determination of whether the IST Acceptance Criteria is met, Table 1 and Table 2 [in NMC's letter of May 6, 2003] will be used to analyze the data.

NMC will follow the stipulations established by MNGP Pump Relief Request PR-03 for the Vibration Alert Levels and Code established limits for the Action Required Levels over the reference value curve range for Comprehensive testing.

The vibration data (Figure 3 through Figure 6 [in NMC's letter of May 6, 2003]) from the test was reviewed and no adverse correlation was evident between flow rate and vibration at the nominal reference point speed. Therefore, NMC will not establish new vibration reference values and related allowable limits over the reference value curve at this time.

If future conditions warrant generation of a new pump reference curve, the NMC will follow the guidance of Code Case OMN-9 for this activity. If new pump reference curves are generated, the NMC does not intend to provide the curves to the NRC.

3.4 NRC Staff Evaluation of Pump Relief Request PR-06

As incorporated by reference in 10 CFR 50.55a, paragraph ISTB 5.1 in the 1995 edition and 1996 addenda of the ASME OM Code requires that HPCI pumps at MNGP undergo a Group B test quarterly and a Comprehensive test biennially. For the Group B test, paragraph ISTB 5.2.2(a) requires operating HPCI pumps at speeds adjusted to the reference point (± 1 percent). Paragraph ISTB 5.2.2(c) states that system resistance during the Group B test may be varied as necessary to achieve the reference point. For the Comprehensive test, paragraph ISTB 5.2.3(a) requires operating HPCI pumps at speeds adjusted to the reference point (± 1 percent). Paragraph ISTB 5.2.3(b) states, in part, that the resistance of the system shall be varied during the Comprehensive test until the flow rate equals the reference point, and that the differential pressure shall then be determined and compared to its reference value. The NRC staff recognizes that it might be difficult for licensees to achieve a precise reference point during these pump tests. Therefore, the NRC staff considers it acceptable for licensees to propose a justified alternative to these ASME OM Code requirements in accordance with 10 CFR 50.55a.

NMC's letter of May 6, 2003, proposes to use ASME Code Case OMN-9 as a guideline in developing a methodology for performing Group B and Comprehensive tests of HPCI pump P-209 at MNGP. For IST programs implementing ASME OM Code-1990 through OMb-1992, OMN-9 provides alternative provisions that rely on the use of reference curves during testing of centrifugal or vertical line shaft pumps in cases where it is impractical to achieve a specific reference value required by the test procedure in paragraph ISTB 5.2(b). OMN-9 specifies that the reference curves be established from a minimum of three data points and have at least one data point for each 20 percent of the maximum pump curve range. OMN-9 indicates that pressure, flow rate, and vibration will be determined during pump testing and compared to associated reference values from the reference curves. Deviations from the reference values are then to be compared to the limits in Subsection ISTB of the ASME OM Code with corrective action taken as specified in the code case.

In Regulatory Guide (RG) 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code," the NRC specifies the acceptability of the provisions in ASME Code Case OMN-9 for the use of reference curves as part of pump testing within the applicable IST programs. In RG 1.192, the NRC places two conditions on the use of OMN-9 by licensees implementing the editions and addenda to the ASME OM Code within the applicability statement of the code case. First, the NRC states that when a reference curve may have been affected by repair, replacement, or routine servicing of a pump, a new reference curve must be determined, or an existing reference curve must be reconfirmed in accordance with Section 3 of OMN-9. Second, the NRC states that if it is necessary or desirable, for some reason other than that stated in Section 4 of OMN-9, to establish an additional reference curve or set of curves, these new curves must be determined in accordance with Section 3 of OMN-9. As of the effective date of August 7, 2003, the NRC will incorporate, by reference, RG 1.192 in 10 CFR 50.55a to identify code cases (including OMN-9) that may be implemented without plant-specific NRC review as acceptable alternatives with certain conditions to the applicable test provisions in the ASME OM Code. In that the ASME has not updated OMN-9 to the recent editions and addenda of the OM Code, NMC requested NRC approval to apply the provisions of the code case in Monticello's IST program developed under the 1995 edition and 1996 addenda of the ASME OM Code in accordance with 10 CFR 50.55a.

In using OMN-9 as a guideline to establish reference curves, NMC collected data for flow, vibration, pressure, and speed during tests of the HPCI pump at MNGP on February 12, 2003, while the pump was operating in an acceptably stable condition. In its supplemental letter of July 22, 2003, NMC said that the IST pump design flow rate for the HPCI pump is 3000 gpm. NMC's letter of May 6, 2003, indicated that the pump flow reference point range of 2900 to 3300 gpm for HPCI pump P-209 is within ± 20 percent of the pump design flow rate, as specified in paragraph ISTB 4.3 of the ASME OM Code for performance of the Comprehensive test. From the data collected over the expected range of IST conditions, NMC established a reference value curve for pressure versus flow rate using a third order polynomial. NMC specified required action and alert range limits based on scalar multiples of the reference value curve. NMC also provided representative graphs of pump differential pressure and flow rate for the Group B and Comprehensive tests in its letter of May 6, 2003.

NMC's letter of May 6, 2003, also provided the results of its vibration readings over the applicable flow range during the HPCI pump test on February 12, 2003, at MNGP. As the testing did not reveal any significant variation in vibration readings, NMC intends to continue to follow the stipulations in its pump relief request PR-03 for vibration alert and action levels.

Prior to developing RG 1.192, the NRC staff approved licensees' applications of ASME Code Case OMN-9 as part of the quarterly testing of pumps for IST programs on a plant-specific basis. NMC's letter of May 6, 2003, is the first request to apply the provisions of OMN-9 to perform Comprehensive tests of pumps under the ASME OM Code. Consistent with the conditions for its use stated in RG 1.192, the NRC staff considers the provisions in OMN-9 to be acceptable for establishing reference curves for Comprehensive and quarterly pump testing and the applicable alert and action ranges.

NMC's letter of May 6, 2003, requested using OMN-9 as an alternative to the provisions in paragraphs ISTB 5.2.2 and ISTB 5.2.3 of the ASME OM Code with respect to operating the HPCI pump at a speed adjusted to the reference point. All other provisions in Subsection ISTB continue to apply. For example, permission to use OMN-9 to establish reference curves as part of an alternative testing methodology does not affect the requirements in paragraphs ISTB 4.2, 4.3, 5.1, and 5.2.3 to perform Comprehensive tests within ± 20 percent of the pump design flow rate on a biennial basis. NMC's letter of May 6, 2003, indicated that if future conditions warrant generation of a new pump reference curve, NMC will follow the guidance in OMN-9 for this activity. In addition, the conditions in RG 1.192 regarding establishing new reference curves, or confirming existing reference curves, apply to the use of OMN-9.

The NRC staff notes that OMN-9 was prepared prior to the revision of the ASME OM Code to incorporate provisions for Comprehensive tests of pumps within ± 20 percent of the pump design flow rate. In describing the reference curves, OMN-9 allows only three data points to be used to establish a reference curve with at least one data point for each 20 percent of the maximum pump curve range. The focus on high flow rates during the Comprehensive tests of pumps under the ASME OM Code emphasizes the importance of collecting sufficient data above 80 percent of the minimum pump design flow to be able to establish an acceptable reference curve. NMC's letter of May 6, 2003, includes tables containing nine data points for pump flow and differential pressure over the range of 2900 to 3300 gpm for both the Group B and Comprehensive tests of HPCI pump P-209 at MNGP. The NRC staff considers NMC's collection of test data in establishing reference curves for the HPCI pump over the flow range of interest to be acceptable.

The NRC staff finds NMC's methodology to establish and use reference curves in the performance of the Group B and Comprehensive tests of HPCI pump P-209 at MNGP provides an acceptable level of quality and safety because NMC will use the method approved by the NRC staff in OMN-9 to establish a reference value curve for pump differential pressure and flow rate, and the requirement for conducting pump IST within ± 20 percent of the pump design flow rate is not affected.

4.0 CONCLUSION

The NRC staff concludes that NMC's request to use reference curves as part of an alternative testing methodology to satisfy the provisions in paragraphs ISTB 5.2.2(a) and ISTB 5.2.3(a) of the ASME OM Code for the Group B and Comprehensive tests, respectively, of the HPCI pump at MNGP provides an acceptable level of quality and safety. On this basis, the NRC staff authorizes NMC's proposed alternative in accordance with 10 CFR 50.55a(a)(3)(i). This relief is authorized for the fourth 10-year IST interval at MNGP.

Principal Contributor: T. Scarbrough

Date: August 7, 2003