July 25, 2005

Mr. Joseph M. Solymossy
Site Vice President
Prairie Island Nuclear Generating Plant
Nuclear Management Company, LLC
1717 Wakonade Drive East
Welch, MN 55089

SUBJECT: PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2 - ISSUANCE OF SAFETY EVALUATION FOR THE FOURTH 10-YEAR INSERVICE TESTING (IST) PROGRAM INTERVAL (TAC NOS. MC4509 AND MC4510)

Dear Mr. Solymossy:

By letter dated June 28, 2004, Nuclear Management Company, LLC (the licensee) submitted four relief requests for the fourth 10-year IST program interval at Prairie Island Nuclear Generating Plant, Units 1 and 2. In response to the U.S. Nuclear Regulatory Commission (NRC) Staff's request for additional information dated November 9, 2004 and March 23, 2005, the licensee submitted additional information to the NRC in letters dated January 14, April 13, and June 7, 2005. In its January 14, 2005, letter, the licensee withdrew Relief Request 5 and submitted an additional six relief requests. In its June 7, 2005, letter, the licensee revised Relief Requests 9 and 10.

The NRC Staff evaluation of the subject relief requests associated with the fourth 10-year IST program (from December 21, 2004, to December 20, 2014) for pumps and valves at Prairie Island Nuclear Generating Plant, Units 1 and 2, is as follows:

For Relief Requests 1, 6, 7, 8, 9, and 10, relief may be granted pursuant to 10 CFR 50.55a(f)(6)(i) for the fourth 10-year interval, on the basis that compliance with the Code requirements are impractical.

For Relief Requests 2 and 3, relief may be granted pursuant to 10 CFR 50.55a(f)(6)(i) for an interim period until September 30, 2006, on the basis that the Code-required testing is impractical to perform with the present system design and the burden that would result if the Code requirements were immediately imposed.

The staff further concludes that granting the relief will not endanger life or property or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

For Relief Request 11, the licensee's proposed alternatives may be authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the fourth 10-year interval, based on the alternative providing an acceptable level of quality and safety. The enclosure contains the NRC staff's evaluation.

Sincerely,

/RA/

Mahesh L. Chawla, Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-282 and 50-306

Enclosure: Safety Evaluation

cc w/encls: See next page

For Relief Request 11, the licensee's proposed alternatives may be authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the fourth 10-year interval, based on the alternative providing an acceptable level of quality and safety. The enclosure contains the NRC staff's evaluation.

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Mahesh L. Chawla, Project Manager, Section 1
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cc w/encls: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE INSERVICE TESTING PROGRAM, FOURTH 10-YEAR INTERVAL

NUCLEAR MANAGEMENT COMPANY, LLC

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2

DOCKET NOS. 50-282 AND 50-306

1.0 INTRODUCTION

By letter dated June 28, 2004, Nuclear Management Company, LLC (the licensee), submitted relief requests associated with its fourth 10-year inservice testing (IST) program plan for pumps and valves for its Prairie Island Nuclear Generating Plant, Units 1 and 2. The licensee proposed several alternatives to the requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code) for its Prairie Island Nuclear Generating Plant, Units 1 and 2, fourth 10-year interval IST program. In response to the Nuclear Regulatory Commission (NRC) staff's request for additional information, the licensee submitted additional information to the NRC in letters dated January 14, April 13, and June 7, 2005. In its January 14, 2005, letter, the licensee withdrew Relief Request 5 and submitted an additional six relief requests. In its June 7, 2005, letter, the licensee revised Relief Requests 9 and 10.

2.0 REGULATORY EVALUATION

The *Code of Federal Regulations*, 10 CFR 50.55a, requires that IST of certain ASME Code Class 1, 2, and 3 pumps and valves be performed at 120-month (10-year) IST program intervals 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 paragraphs (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. In accordance with 10 CFR 50.55a(f)(4)(ii), licensees are required to comply with the requirements of the latest edition and addenda of the ASME Code incorporated by reference in the regulations 12 months prior to the start of each 120-month IST program interval. In accordance with 50.55a(f)(4)(iv), IST of pumps and valves may meet the requirements set forth in subsequent editions and addenda that are incorporated by reference in 10 CFR 50.55a(b), subject to NRC approval. Portions of editions or addenda may be used provided that all related requirements of the respective editions and addenda are met. 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. Section 50.55a authorizes the Commission to approve alternatives

and to 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 Code requirements which are acceptable. Further guidance is given in GL 89-04, Supplement 1, and NUREG-1482, Rev. 0 and Rev. 1 "Guidance for Inservice Testing at Nuclear Power Plants."

By letter dated June 28, 2005, Nuclear Management Company, LLC (the licensee), proposed several alternatives to the requirements of the ASME OM Code for its Prairie Island Nuclear Generating Plant, Unit 1 and Unit 2, fourth 10-year IST interval. The Prairie Island Nuclear Generating Plant, Unit 1 and Unit 2, fourth 10-year IST interval commenced December 21, 2004. The fourth 10-year interval IST programs were developed to meet the requirements of the ASME OM Code 1998 edition through the 2000 addenda pursuant to 10 CFR 50.55a(f)(4)(ii).

The NRC's findings with respect to authorizing alternatives and granting or denying the IST program relief requests are given below.

3.0 TECHNICAL EVALUATION

3.1 Relief Request 1

3.1.1 Code Requirements

The licensee requested relief from ISTB-3540(b) which requires that, on vertical line shaft pumps, measurements shall be taken on the upper motor bearing housing in three approximately orthogonal directions, one of which is the axial direction. Relief was requested for the following pumps:

Diesel-Driven Cooling Water Pump 12
Diesel-Driven Cooling Water Pump 22
Motor-Driven Cooling Water Pump 121

3.1.2 Licensee's Basis for Requesting Relief

ISTB-3540(b) specifies that the vibration reading locations be on the upper motor bearing housing. Inaccessibility due to pump design precludes the taking of the required vibration measurements at certain Code-specified locations on the subject pumps. Therefore, it is impractical to meet the Code requirements. The pumps would have to be redesigned or replaced to accommodate compliance with the Code.

The driver for the diesel-driven cooling water pumps is a diesel engine coupled to a right angle drive. The pump bearing is inaccessible for vibration measurements. The thrust from the pump and driver would be transmitted to the right angle drive, thus monitoring of vibration levels at this location will give an acceptable indication of any pump degradation.

The design of the motor-driven cooling water pump limits access to the upper thrust bearing housing to take vibration readings with a portable instrument while the pump is running. To climb to the top of the motor while it is running is a potential personnel hazard. Vibration

measurements taken on the pump housing in three orthogonal directions, one being in the axial direction, will give an acceptable indication of any pump degradation. The axial vibration from the upper motor thrust bearing would be transmitted to the motor housing.

3.1.3 Licensee's Proposed Alternative Testing

Diesel-driven cooling water pump vibration measurements will be taken on the right angle drive of the pumps in three orthogonal directions, one of which is the axial direction. One additional vibration measurement will be taken on the diesel engine.

Motor-driven cooling water pump vibration measurements will be taken on the motor housing in three orthogonal directions, one of which is the axial direction. The axial reading will be taken on the side of the housing, midway between the upper and lower bearing.

3.1.4 Evaluation

ISTB-3540(b) requires that, on vertical line shaft pumps, measurements shall be taken on the upper motor bearing housing in three approximately orthogonal directions, one of which is the axial direction. Inaccessibility due to pump design precludes the taking of required vibration measurements at the Code-specified locations on the subject pumps; therefore, it is impractical to meet the Code requirements. The pumps would have to be redesigned or replaced to accommodate compliance with the Code. Since the thrust from the pump and driver in the case of the diesel-driven cooling water pumps would be transmitted to the right angle drive, monitoring vibration levels at this location will give an acceptable indication of pump degradation. In the case of the motor-driven cooling water pump, the axial vibration from the upper motor thrust bearing would be transmitted to the motor housing, and vibration measurements taken on the pump housing in three orthogonal directions, one being in the axial direction, will give an acceptable indication of pump degradation.

3.1.5 Conclusion

Based on the above evaluation, the staff grants the licensee's request for relief pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the Code requirements is impractical and that the alternative provides reasonable assurance of the operational readiness of the cooling water pumps. The staff further concludes that granting the relief will not endanger life or property or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

3.2 Relief Request 2

3.2.1 Code Requirements

The licensee requested relief from ISTB-3550, which requires that a rate or quantity meter be installed in the pump test circuit. If a meter does not indicate the flow directly, the record shall include the method used to reduce the data. Relief was requested for the following pumps:

Diesel-driven cooling water pump 12
Diesel-driven cooling water pump 22

3.2.2 Licensee's Basis for Requesting Relief

ISTB-3550 specifies that, when measuring flow rate, a rate or quantity meter installed in the pump test circuit is to be used. If a meter does not indicate the flow rate directly, the record shall include the method used to reduce the data. The design of the diesel-driven cooling water pumps has an unmetered bypass line, which feeds a jacket cooler and a gear oil cooler. Isolation of this flow is not possible since cooling is required during pump operation. The control valve that supplies the jacket cooler opens to the same position during each diesel test so there is assurance that resistance will not change. Additional unmetered flow feeds the chemical treatment and filter water system. These flows are small and continually in service. The diesel-driven cooling water pump piping design, and therefore, system resistance of each bypass line will remain constant for each test. It can be shown that the pressure, flow, and flow paths of the system during pump testing, as controlled by the procedure, will assure negligible changes in the unmetered flow paths. The flow is a small percentage of the reference flow and has low potential to mask degrading flow rates.

The pump metered flow and pressure readings taken during regular testing can be trended per Code requirements and will give adequate indication should pump degradation occur.

3.2.3 Licensee's Proposed Alternative Testing

Pump tests will be performed using non-instrumented bypass lines that feed a jacket cooler and a gear oil cooler, chemical treatment, and filtered water.

3.2.4 Evaluation

ISTB-3550 requires that a rate or quantity meter installed in the pump test circuit be used when measuring flow rate. If a meter does not indicate the flow rate directly, the record shall include the method used to reduce the data. The design of the diesel-driven cooling water pumps has an unmetered bypass line that feeds a jacket cooler and a gear oil cooler. Isolation of this flow is not possible since cooling is required during pump operation. Additional unmetered flow feeds the chemical treatment and filter water system. These flows are estimated at approximately 8.0 percent of the reference flow value. The bypass lines are not fixed resistance systems and fouling of the associated heat exchangers/filters would change the resistance of the bypass lines which could potentially mask pump degradation.

Long-term relief cannot be granted based on the lack of information in the relief request explaining how the testing will account for potential masking of degrading flow rates. However, interim relief can be granted based on the impracticality of the design and the burden that would result if the Code requirements were immediately imposed, such as a plant shutdown because testing in accordance with the Code could not be performed. The current test method will identify significant degrading trends for an interim period, providing an adequate level of assurance of the operational readiness of the pumps.

3.2.5 Conclusion

Interim relief until September 30, 2006, is granted pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the Code requirements is impractical and that the alternative provides reasonable assurance of the operational readiness of the pumps for the interim period. The staff further concludes that granting relief will not endanger life or property or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The licensee should respond prior to September 30, 2006, to inform the staff of the actions taken and submit a revised relief request if necessary.

3.3 Relief Request 3

3.3.1 Code Requirements

The licensee requested relief from ISTB-3550 which requires that a rate or quantity meter be installed in the pump test circuit. If a meter does not indicate the flow directly, the record shall include the method used to reduce the data. Relief was requested for the following pump:

Motor-driven cooling water pump 121

3.3.2 Licensee's Basis for Requesting Relief

ISTB-3550 specifies when measuring flow rate, a rate or quantity meter installed in the pump test circuit is to be used. If a meter does not indicate the flow rate directly, the record shall include the method used to reduce the data.

The design of the motor-driven cooling water pump has an unmetered bypass line that feeds the chemical treatment and filter water flows. These flows are small and continually in service. The motor-driven cooling water pump piping design, and therefore system resistence, of each bypass line will remain constant for each test. It can be shown that the pressure, flow and flow paths of the system during pump testing, as controlled by the procedure, will assure negligible changes in the unmetered flow path. The flow is a small percentage of the reference flow and has a low potential to mask degrading flow rates.

The pump metered flow and pressure readings taken during regular testing can be trended per code requirements and will give adequate indication should pump degradation occur.

3.3.3 Licensee's Proposed Alternative Testing

Pump tests will be performed using non-instrumented bypass lines that feed chemical treatment and filtered water.

3.3.4 Evaluation

ISTB-3550 requires that a rate or quantity meter installed in the pump test circuit be used when measuring flow rate. If a meter does not indicate the flow rate directly, the record shall include the method used to reduce the data. The design of the motor-driven cooling water pump has an unmetered bypass line, which feeds the chemical treatment and filter water system. These flows are estimated at approximately 2.0 percent of the reference flow value. The bypass lines are not fixed resistance systems and fouling of the associated filters would change the resistance of the bypass lines which could potentially mask pump degradation.
Long-term relief cannot be granted based on the lack of information in the relief request explaining how the testing will account for potential masking of degrading flow rates. However, interim relief can be granted based on the impracticality of the design and the burden that would result if the Code requirements were immediately imposed, such as a plant shutdown because testing in accordance with the Code could not be performed. The current test method will identify significant degrading trends for an interim period, providing an adequate level of assurance of the operational readiness of the pumps.

3.3.5 Conclusion

Interim relief until September 30, 2006, is granted pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the Code requirements is impractical and that the alternative provides reasonable assurance of the operational readiness of the pumps for the interim period. The staff further concludes that granting relief will not endanger life or property or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The licensee should respond prior to September 30, 2006, to inform the staff of the actions taken and submit a revised relief request if necessary.

3.4 Relief Request 6

3.4.1 Code Requirements

The licensee requested relief from ISTB-5121 and ISTB-5123 which requires that pump testing be performed with the pump operating at a specified reference point. Relief was requested for the following pumps:

Component cooling water pump 11
Component cooling water pump 12
Component cooling water pump 21
Component cooling water pump 22

3.4.2 Licensee's Basis for Requesting Relief

The component cooling system does not allow performance of hydraulic tests at specific reference points. Because of changing system loading conditions it is not practical to duplicate the exact reference point for each pump test. Some of the variable flows are the result of the cycling of flow control valves for system cooling demand. Examples of these variable loads are the spent fuel heat exchanger and letdown and excess letdown heat exchangers. Plotting

pump curves for flow and differential pressure over the range of conditions expected during the system's normal operation would allow evaluation of the pump in as-found system conditions.

3.4.3 Licensee's Proposed Alternative Testing

The guidelines set forth in Code Case OMN-9, "Use of a Pump Curve for Testing," will be followed. The pumps will be tested in a range of flows, and the results compared to acceptance criteria based upon a portion of the pump curve and the hydraulic acceptance criteria given in ISTB.

3.4.4 Evaluation

Paragraphs ISTB-5121(b) and ISTB-5123(b) for centrifugal pumps, and paragraphs ISTB-5221(b) and ISTB-5223(b) for vertical line shaft pumps, require that pump flow rate and differential pressure be evaluated against reference values to monitor pump condition and to allow detection of degradation. The component cooling water pumps operate under a variety of flow rate and differential pressure conditions. Varying the flow rate of these pumps is impractical during normal plant operating conditions because of the potential loss of adequate flow to heat exchangers and the potential of creating plant transients.

As discussed in NUREG-1482, Revision 0, Section 5.2, the use of pump curves for reference values of flow rate and differential pressure is acceptable when it is impractical to establish a fixed set of reference values. Pump curves represent a set of infinite reference points of flow rate and differential pressure. Establishing a reference curve for the pump when it is known to be operating acceptably, and basing the acceptance criteria on this curve, can permit evaluation of pump condition and detection of degradation. However, because of a greater potential for error associated with the use of pump curves, Section 5.2 of NUREG-1482, Revision 0, delineates seven elements of the procedures for developing and implementing the curves that should be incorporated into the IST program. These elements are included in Code Case OMN-9. The NRC staff considers the provisions in OMN-9 to be acceptable for establishing reference curves for comprehensive and quarterly pump testing and for the determination of the applicable alert and action ranges.

The licensee proposed use of Code Case OMN-9, "Use of a Pump Curve for Testing," which is consistent with the guidelines in Section 5.2 of NUREG-1482, Revision 0, and provides reasonable assurance of the operational readiness of the component cooling water pumps. However, NUREG-1482, Revision 0, was developed based on the ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition. The latest staff guidance is described in NUREG-1482, Revision 1, which is applicable to the ASME OM Code, 1998 Edition through 2000 Addenda. NUREG-1482, Revision 1, Section 5.2 allows the use of Code Case OMN-9, Revision 0, "Use of Pump Curves for Testing," which the NRC staff subsequently included in Regulatory Guide (RG) 1.192, "Operation and Maintenance Code Case Acceptability, ASME Code Case." This RG lists the OM Code Cases that the NRC staff finds acceptable for licensees to implement in their IST program. In particular, the staff accepted Code Case OMN-9, with the conditions identified in RG 1.192. The licensee states that new pump curves will be developed in accordance with OMN-9 and the conditions identified in RG 1.192. Relief is required to implement Code Case OMN-9 because Code Case OMN-9 is not applicable to the 1998 edition of the ASME OM Code.

3.4.5 Conclusion

Based on the above evaluation, the staff grants the licensee's request for relief pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the Code requirements is impractical and that the alternative provides reasonable assurance of the operational readiness of the component cooling water pumps. The staff further concludes that granting the relief will not endanger life or property or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

3.5 Relief Request 7

3.5.1 Code Requirements

The licensee requested relief from ISTB-5121 and ISTB-5123 which requires that pump testing be performed with the pump operating at a specified reference point. Relief was requested for the following pumps:

Safeguards chilled water pump 121
Safeguards chilled water pump 122

3.5.2 Licensee's Basis for Requesting Relief

The safeguards chilled water system does not allow performance of hydraulic tests at specific reference points. Flow within the system is constantly changing due to temperature control valves in the system that are continuously repositioning due to changes in heat loads in the serviced rooms. It is not desirable to adjust the flow to a known reference value because the pump discharge valve, which would be used for the adjustment, is a gate valve not designed for throttle applications. Plotting a pump curve for flow and differential pressure over the range of conditions expected during the system's normal operation would allow evaluation of the pump in as-found system conditions. The proposed alternative will give indication of pump degradation.

3.5.3 Licensee's Proposed Alternative Testing

The guidelines set forth in Code Case OMN-9, "Use of a Pump Curve for Testing," will be followed. The pumps will be tested in a range of flows, and the results compared to acceptance criteria based upon a portion of the pump curve and the hydraulic acceptance criteria given in ISTB.

3.5.4 Evaluation

Paragraphs ISTB-5121(b) and ISTB-5123(b) for centrifugal pumps, and paragraphs ISTB-5221(b) and ISTB-5223(b) for vertical line shaft pumps, require that pump flow rate and differential pressure be evaluated against reference values to monitor pump condition and to allow detection of degradation. The safeguards chilled water pumps operate under a variety of flow rate and differential pressure conditions. Varying the flow rate of these pumps is impractical during normal plant operating conditions because the pump discharge valve is not designed for throttle applications.

As discussed in NUREG-1482, Revision 0, Section 5.2, the use of pump curves for reference values of flow rate and differential pressure is acceptable when it is impractical to establish a fixed set of reference values. Pump curves represent a set of infinite reference points of flow rate and differential pressure. Establishing a reference curve for the pump when it is known to be operating acceptably and basing the acceptance criteria on this curve can permit evaluation of pump condition and detection of degradation. However, because of a greater potential for error associated with the use of pump curves, Section 5.2 of NUREG-1482, Revision 0, delineates seven elements of the procedures for developing and implementing the curves that should be incorporated into the IST program. These elements are included in Code Case OMN-9. The NRC staff considers the provisions in OMN-9 to be acceptable for establishing reference curves for comprehensive and quarterly pump testing and for the determination of the applicable alert and action ranges.

The licensee proposed use of Code Case OMN-9, "Use of a Pump Curve for Testing," which is consistent with the guidelines in Section 5.2 of NUREG-1482, Revision 0, and provides reasonable assurance of the operational readiness of the safeguards chilled water pumps. However, NUREG-1482, Revision 0, was developed based on the ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition. The latest staff guidance is described in NUREG-1482, Revision 1, which is applicable to the ASME OM Code, 1998 Edition through 2000 Addenda. NUREG-1482, Revision 1, Section 5.2 allows the use of Code Case OMN-9, Revision 0, "Use of Pump Curves for Testing," which the NRC staff subsequently included in Regulatory Guide RG 1.192, "Operation and Maintenance Code Case Acceptability, ASME Code Case." This regulatory guide lists the OM Code Cases that the NRC staff finds acceptable for licensees to implement in their IST program. In particular, the staff accepted Code Case OMN-9, with the conditions identified in RG 1.192. The licensee states that new pump curves will be developed in accordance with OMN-9 and the conditions identified in RG 1.192. Relief is required to implement Code Case OMN-9 because Code Case OMN-9 is not applicable to the 1998 edition of the ASME OM Code.

3.5.5 Conclusion

Based on the above evaluation, the NRC staff grants the licensee's request for relief pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the Code requirements is impractical and that the alternative provides reasonable assurance of the operational readiness of the safeguards chilled water pumps. The staff further concludes that granting the relief will not endanger life or property or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

3.6 Relief Request 8

3.6.1 Code Requirements

The licensee requested relief from ISTB-5221, ISTB-5222, and ISTB-5223 which requires that pump testing be performed with the pump operating at a specified reference point. Relief was requested for the following pumps:

Diesel cooling water pump 12
Diesel cooling water pump 22
Motor-driven cooling water pump 121

3.6.2 Licensee's Basis for Requesting Relief

The cooling water pumps operate during a variety of flow rates, differential pressure conditions and system demands resulting in the inability to easily establish a stable flow rate or differential pressure for evaluation against reference values. Varying the flow rate of the cooling water pumps is impractical during normal operation due to the potential loss of adequate flow to various components dependent upon cooling water for heat removal. The potential interruption of cooling water flow for these components is burdensome and could result in a reactor transient or trip.

3.6.3 Licensee's Proposed Alternative Testing

The guidelines set forth in Code Case OMN-9, "Use of a Pump Curve for Testing," will be followed. The pumps will be tested in a range of flows, and the results compared to acceptance criteria based upon a portion of the pump curve and the hydraulic acceptance criteria given in ISTB.

3.6.4 Evaluation

Paragraphs ISTB-5121(b) and ISTB-5123(b) for centrifugal pumps, and paragraphs ISTB-5221(b) and ISTB-5223(b) for vertical line shaft pumps, require that pump flow rate and differential pressure be evaluated against reference values to monitor pump condition and to allow detection of degradation. The diesel cooling water pumps and the motor-driven cooling water pump operate under a variety of flow rate and differential pressure conditions. Varying the flow rate of these pumps is impractical during normal plant operating conditions because of the potential loss of adequate flow to heat exchangers and the potential of creating plant transients. Imposing the Code requirements on the licensee would be a burden in that interruption of cooling water flow could cause a reactor transient or a trip.

As discussed in NUREG-1482, Revision 0, Section 5.2, the use of pump curves for reference values of flow rate and differential pressure is acceptable when it is impractical to establish a fixed set of reference values. Pump curves represent a set of infinite reference points of flow rate and differential pressure. Establishing a reference curve for the pump when it is known to be operating acceptably, and basing the acceptance criteria on this curve, can permit evaluation of pump condition and detection of degradation. However, because of a greater potential for error associated with the use of pump curves, Section 5.2 of NUREG-1482, Revision 0, delineates seven elements of the procedures for developing and implementing the curves that should be incorporated into the IST program. These elements are included in the Code Case OMN-9. The NRC staff considers the provisions in OMN-9 to be acceptable for establishing reference curves for comprehensive and quarterly pump testing and for the determination of the applicable alert and action ranges.

The licensee proposed use of Code Case OMN-9, "Use of a Pump Curve for Testing," which is consistent with the guidelines in Section 5.2 of NUREG-1482, Revision 0, and provides

reasonable assurance of the operational readiness of the diesel cooling water pumps and the motor-driven cooling water pump. However, NUREG-1482, Revision 0, was developed based on the ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition. The latest staff guidance is described in NUREG-1482, Revision 1, which is applicable to the ASME OM Code, 1998 Edition through 2000 Addenda. NUREG-1482, Revision 1, Section 5.2 allows the use of Code Case OMN-9, Revision 0, "Use of Pump Curves for Testing," which the NRC staff subsequently included in Regulatory Guide (RG) 1.192, "Operation and Maintenance Code Case Acceptability, ASME Code Case." This regulatory guide lists the OM Code Cases that the NRC staff finds acceptable for licensees to implement in their IST program. In particular, the NRC staff accepted Code Case OMN-9, with the conditions identified in RG 1.192. The licensee states that new pump curves will be developed in accordance with OMN-9 and the conditions identified in RG 1.192. Relief is required to implement Code Case OMN-9 because Code Case OMN-9 is not applicable to the 1998 edition of the ASME OM Code.

3.6.5 Conclusion

Based on the above evaluation, the staff grants the licensee's request for relief pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the Code requirements is impractical and that the alternative provides reasonable assurance of the operational readiness of the cooling water pumps. The staff further concludes that granting the relief will not endanger life or property or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

3.7 Relief Request 9

3.7.1 Code Requirements

The licensee requested relief from ISTB Table ISTB-3000-1 which requires that flow rate be measured during inservice Group A tests. Relief was requested for the following pumps:

Residual heat removal pump 11
Residual heat removal pump 12
Residual heat removal pump 21
Residual heat removal pump 22

3.7.2 Licensee's Basis for Requesting Relief

During power operation, the only circuit available for quarterly testing of these pumps is the minimum flow recirculation line. The residual heat removal (RHR) pump recirculation line used during quarterly testing is designed with flow metering, but the installed instrumentation cannot be read with sufficient accuracy to meet the Code requirements due to hydraulic fluctuations at the orifice. It is believed that the cause of the hydraulic instability is a combination of pump suction and discharge recirculation, minor cavitation, and the location of the flow orifice which is not located free from local flow obstructions.

The RHR pumps function as Group A pumps only during shutdown conditions. Measurements of differential pressure and vibration during the quarterly pump test ensure that the pump is

capable of starting and developing pressure in the event of an accident. Performance of a test that measures pump differential pressure, flow rate and bearing vibration during cold and refueling shutdown evolutions provides adequate information to determine and trend pump degradation.

3.7.3 Licensee's Proposed Alternative Testing

For the RHR pumps, a path exists during cold and refueling shutdowns to measure flow rate. A test meeting the Code requirements will be done during cold and refueling shutdown evolutions. During the quarterly pump testing, differential pressure and vibration will be measured.

3.7.4 Evaluation

The RHR pumps can only be tested quarterly using a fixed resistence flow path. GL 89-04, Position 9, "Pump Testing Using Minimum-Flow Return Lines With or Without Flow Measuring Devices," identifies that for quarterly pump testing where flow can only be established through a non-instrumented minimum-flow path during quarterly testing, and a path exists at cold shutdown or refueling outages to perform a test of the pump under full or substantial flow conditions, the staff has determined the increased interval is an acceptable alternative to the Code requirements. This is contingent upon pump differential pressure, flow rate, and bearing vibration being measured during the cold shutdown or refueling outage test and that quarterly testing measures at least pump differential pressure and vibration.

It is impractical for the licensee to test the RHR pumps at power using the normal instrumented flow path due to the design of the RHR system. The licensee's alternative meets the requirements of GL 89-04, Position 9, and the guidance contained in NUREG-1482, Rev. 1 with respect to quarterly pump testing where flow can only be established through a non-instrumented minimum-flow path during quarterly testing, and a path exists at cold shutdown or refueling outages to perform a test of the pump under full or substantial flow conditions. The licensee's alternative to test quarterly using the recirculation flow path measuring differential pressure and vibration, and test at a substantial flow rate during cold and refueling shutdowns measuring flow rate, differential pressure and vibration, provides reasonable assurance of the operational readiness of the RHR pumps.

3.7.5 Conclusion

Based on the above evaluation, the staff grants the licensee's request for relief pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the Code requirements is impractical and that the alternative provides reasonable assurance of the operational readiness of the RHR pumps. The staff further concludes that granting the relief will not endanger life or property or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

3.8 Relief Request 10

3.8.1 Code Requirements

The licensee requested relief from ISTB Table ISTB-3000-1 which requires that flow rate be measured during inservice Group A tests. Relief was requested for the following pumps:

Turbine-driven auxiliary feedwater (AFW) pump 11
Turbine-driven AFW 22
Motor-driven AFW pump 21

3.8.2 Licensee's Basis for Requesting Relief

During power operation, the only circuit available for quarterly testing of these pumps is the non-instrumented minimum flow recirculation line. The AFW pumps function as Group A pumps only during shutdown conditions. Measurement of speed (for the turbine-driven pumps), differential pressure and vibration during the quarterly pump test ensures that the pump is capable of starting and developing pressure in the event of an accident. Performance of a test that measures speed (for the turbine-driven pumps), pump differential pressure, flow rate, and vibration during outages provides adequate information to determine and trend pump degradation.

3.8.3 Licensee's Proposed Alternative Testing

A test meeting Code requirements will be done during cold or refueling shutdown evolutions. During quarterly pump testing, speed (for the turbine driven pumps), differential pressure, and vibration will be measured.

3.8.4 Evaluation

The identified AFW pumps can only be tested quarterly using a fixed resistence non-instrumented minimum recirculation flow path. GL 89-04, Position 9, "Pump Testing Using Minimum-Flow Return Lines With or Without Flow Measuring Devices," identifies that for quarterly pump testing where flow can only be established through a non-instrumented minimum-flow path during quarterly testing, and a path exists at cold shutdown or refueling outages to perform a test of the pump under full or substantial flow conditions, the staff has determined the increased interval is an acceptable alternative to the Code requirements. This is contingent upon pump differential pressure, flow rate, and bearing vibration being measured during the cold shutdown or refueling outage test and that quarterly testing measure at least pump differential pressure and vibration.

It is impractical for the licensee to test the identified AFW pumps at power using the instrumented flow path due to the design of the AFW system. The licensee's alternative meets the requirements of GL 89-04, Position 9, and the guidance contained in NUREG-1482, Rev. 1 with respect to quarterly pump testing where flow can only be established through a non-instrumented minimum-flow path during quarterly testing, and a path exists at cold shutdown or refueling outages to perform a test of the pump under full or substantial flow conditions. The licensee's alternative to test quarterly using a non-instrumented recirculation flow path

measuring speed (for the turbine-driven pumps), differential pressure and vibration, and testing at a substantial flow rate during cold and refueling shutdown measuring speed (for the turbine-driven pumps), flow rate, differential pressure and vibration, provides reasonable assurance of the operational readiness of the AFW pumps.

3.8.5 Conclusion

Based on the above evaluation, the staff grants the licensee's request for relief pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the Code requirements is impractical and that the alternative provides reasonable assurance of the operational readiness of the AFW pumps. The staff further concludes that granting the relief will not endanger life or property or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

3.9 Relief Request 11

3.9.1 Code Requirements

The licensee requested relief from ISTC-5221(c) which requires that check valve disassembly and inspection be performed during refueling outages. Relief was requested for the following cooling water system valves:

CL-43-2
CL-43-3
2CL-43-2

3.9.2 Licensee's Basis for Requesting Relief

Disassembly and inspection of valves CL-43-2, CL-43-3, and 2CL-43-2 every refueling outage would be burdensome due to the plant-specific cooling water system configuration. The cooling water pumps and supply headers are safeguards train-specific, not unit-specific, and therefore, have operability requirements for both units. That is, during a refueling outage on one unit, the safeguards pumps and supply headers are still required to be operable for the operating unit. In an effort to balance shutdown safety assessment, outage complexity, and on-line risk, Prairie Island has determined that the preferred time to perform the periodic preventive maintenance on the safety-related cooling water pumps is on-line. This preventive maintenance occurs every 18 months and is an opportune time to perform the check valve inspections in order to limit system unavailability. With numerous combinations of safeguards pumps out of service for maintenance during an outage, maintaining the safeguards cooling water pumps operable enhances shutdown safety.

An acceptable testing frequency can be maintained without being tied to the refueling outage. Inservice testing on a frequency that maintains the acceptable time period between testing activities during the fuel cycle is consistent with the intent of ISTC-5221(c).

3.9.3 Licensee's Proposed Alternative Testing

Each valve will be disassembled, manually full stroke exercised, and inspected once each fuel cycle (currently 18 months). All valves will be considered a group of one.

3.9.4 Evaluation

Valves CL-43-2, CL-43-3, and 2CL-43-2 are 20-inch, cooling water pump discharge check valves. These valves are located at the discharge of each of three safeguards cooling water pumps.

The cooling water system consists of a common discharge header for the cooling water pumps that directs flow into two separate 100 percent capacity cooling water headers. Each header then supplies loops in the turbine and auxiliary buildings and containments for the two units. Thus, there are two technical specification required cooling water trains which supply the needs of both units with each train consisting of one pump, one header and the associated piping and instrumentation. The system contains two safety-related diesel driven pumps and one safety-related motor-driven pump. The motor-driven pump may be directed to either cooling water header when aligned in its safeguard mode of operation. In this case, the motor-driven pump may replace a diesel driven pump.

Due to the design flexibility provided by three safeguards pumps, each individual safeguards pump and discharge check valve can be removed from service to perform preventive maintenance while the other two safeguards pumps continue to provide the required cooling. Both technical specification required trains remain fully operable and a technical specification action statement is not entered while the maintenance is performed.

Disassembly and inspection of the check valves will be performed in conjunction with cooling water pump preventive maintenance activities which are performed with the units on-line on an 18 month frequency. Diesel-driven pump preventive maintenance activities generally take between 24 to 96 hours to complete and the check valve disassembly and inspection generally requires 4 to 6 hours to perform and is performed in parallel with the pump activities. Motor-driven pump preventive maintenance activities generally take between 8 to 36 hours to complete and the check valve disassembly and inspection generally requires 5 to 8 hours to perform and is performed in parallel with the pump activities. The valve inspection activities do not impact the scheduled pump work window durations.

ISTC-5221(c) permits check valves to be disassembled and inspected every refueling outage to verify operability. ISTC-5221(c) limits disassembly and inspection of check valves to refueling outages only. In this relief request, the licensee proposed to disassemble and inspect the check valves on a frequency of once during each operating cycle (18 months) in lieu of once during each refueling outage. In its review and evaluation of the licensee's relief request, the NRC staff found, based on the evaluation of the information provided by the licensee and the following considerations, that: (1) the design of the system is such that the check valve can be disassembled with the unit on-line without entering a technical specification limiting condition for operation; (2) the increase in risk associated with this relief request is small and within the safety margins; and (3) the surveillance requirement will be met for disassembly and inspection

of the check valves on a frequency of once during each operating cycle (18 months) with the units on-line.

The NRC staff concludes that the licensee's proposed sample disassembly and inspection program with the alternative testing frequency of once during each operating cycle on an 18 month frequency in lieu of once during each refueling outage provides an acceptable level of quality and safety. The proposed alternative provides an acceptable method to meet the Code requirements in ISTC-5221(c).

3.9.5 Conclusion

Based on the above evaluation, the NRC staff concludes that, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative is authorized on the basis that the proposed alternative provides an acceptable level of quality and safety. This alternative is authorized for the remainder of the fourth 10-year inservice test interval.

4.0 REFERENCES

U.S. Code of Federal Regulations, Domestic Licensing of Production and Utilization Facilities," Part 50, Chapter I, Title 10, "Energy," Section 50.55a, Codes and standards.

U.S. Nuclear Regulatory Commission, "Guidance on Developing Acceptable Inservice Testing Programs," Generic Letter 89-04, through Supplement 1, April 4, 1995.

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Letter, J. Solymossy, Nuclear Management Company, LLC to NRC, "Submittal of the 4th Interval Insevice Testing Plan - Units 1 & 2," dated June 28, 2004.

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