U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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Report No:	50-263/98013(DRS)
Facility:	Monticello Nuclear Generating Station
Licensee:	Northern States Power Company
Location	2807 West Highway 75 Monticello, MN 55362
Dates:	August 10-13, 1998
Inspectors:	Andrew Dunlop, Reactor Engineer, RIII Adele DiBiasio, PRA Consultant, BNL
Approved by:	James Gavula, Chief Engineering Specialists Branch 1 Division of Reactor Safety

EXECUTIVE SUMMARY

Monticello Nuclear Generating Station
NRC Inspection Report 50-263/98013

This inspection was a follow-up of the June 1997 maintenance rule baseline inspection that reviewed the licensee's implementation of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." In addition, this inspection reviewed an inservice testing issue concerning relief valve set-pressure testing. The report covers a 4-day on-site inspection by a regional inspector and a contractor from Brookhaven National Laboratory.

The program met the requirements of the maintenance rule; concerns and open issues identified during the baseline inspection were adequately resolved.

Maintenance

- The periodic assessment met the requirements of the maintenance rule; however, the balancing of reliability and availability for 10 CFR 50.65 (a)(1) systems was not well-documented.

- The establishment of performance criteria was considered acceptable. The reliability and unavailability performance criteria established were adequately linked to the values assumed in the probabilistic risk assessment. In addition, specific performance criteria were established for all standby systems to ensure adequate monitoring.

- As a result of the changes to the structural monitoring program and a better understanding of how the baseline structural inspections were conducted, the structural monitoring program was considered acceptable.

- Although a significant amount of work was performed to ensure compliance with OM-1 [American Society of Mechanical Engineers, Operation and Maintenance of Nuclear Power Plant Standard, Part 1, "Requirements for Inservice Testing of Nuclear Power Plant Pressure Relief Devices"] for the testing of relief valves, establishment of certified correlations had not yet been sufficiently completed to closed an unresolved item.

Report Details

Summary of Plant Status

The plant was operating at full power during the inspection.

II. Maintenance

M1 Conduct of Maintenance (62706, 73756)

The primary focus of the inspection was to follow up on issues identified during the June 1997 baseline inspection (NRC Inspection Report 50-263/97007) to verify that the licensee had implemented a maintenance monitoring program which satisfied the requirements of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of the Maintenance at Nuclear Power Plants," (the maintenance rule). In addition, this inspection reviewed an inservice testing issue concerning relief valve set-pressure testing. The inspection was performed by a regional inspector and a consultant from the Brookhaven National Laboratory.

M1.1 10 CFR 50.65 (a)(3) Periodic Evaluations

a. Inspection Scope

Paragraph (a)(3) of the maintenance rule (MR) required that performance and condition monitoring activities and associated goals and preventive maintenance activities be evaluated, taking into account, where practical, industry-wide operating experience. In addition, adjustments should be made, where necessary, to assure that the objective of preventing failures through the performance of preventive maintenance was appropriately balanced against the objective of minimizing unavailability due to monitoring or preventive maintenance. This evaluation was required to be performed at least one time during each refueling cycle, not to exceed 24 months between evaluations. The inspectors reviewed the 2nd quarter 1998 periodic assessment.

b. Observations and Findings

The 2nd quarter periodic assessment was considered acceptable as had previous assessments reviewed during the baseline inspection. The balancing of 10 CFR 50.65 (a)(1) systems, however, did not appear to be addressed in the report. Through discussions with the licensee, they considered an 10 CFR 50.65 (a)(1) system's performance criteria balanced based on the criteria being developed by the probablistic risk assessment (PRA) and sensitivity study. The inspectors indicated that when the criteria was met this would be true; however, when the criteria were not met, as the case for 10 CFR 50.65 (a)(1) systems, the criteria should be assessed to verify a balance. For example, if the failure rate was exceeded and unavailability was low, more unavailability for additional preventive maintenance might be needed to reduce the failures. The licensee indicated that availability and reliability data were reviewed to

ensure a balance, although it was not specifically documented in the report. One comment from the baseline inspection indicated that goals were not well-defined in assessment reports. This was adequately resolved, based on the recent assessment report.

c. Conclusions

The assessments conducted by the licensee were acceptable, although balancing of reliability and availability for 10 CFR 50.65 (a)(1) systems was not well-documented in the report.

M1.2 (a)(1) Goal Setting and Monitoring and (a)(2) Preventive Maintenance

a. Inspection Scope

The inspectors reviewed program documents in order to evaluate the process established to set goals and monitor under 10 CFR 50.65 (a)(1) and to verify that preventive maintenance was effective under 10 CFR 50.65 (a)(2) of the MR. The inspectors reviewed systems to verify that goals or performance criteria were established in accordance with safety, that appropriate monitoring and trending were being performed, and that corrective actions were taken when an structure, system or component (SSC) failed to meet its goal or performance criteria or experienced a maintenance preventible functional failure (MPFF). These issues were reviewed for the systems identified in the baseline inspection violations. In addition, the inspectors assessed by what means performance of structures, determined to be within scope, was monitored for degradation.

b. Observations and Findings

The inspectors determined that the MR program document provided appropriate guidelines for establishing performance criteria and goals for SSCs scoped under the MR. The licensee had established performance criteria and/or goals for all SSC functions designated within scope. The concerns identified during the baseline inspection were adequately resolved, as discussed below.

b.1 Performance Criteria for Reliability and Unavailability

In response to the violation identified during the baseline inspection concerning the lack of a linkage between the performance criteria and the assumptions in the PRA, the licensee performed a number of studies to establish the reliability and availability performance criteria and demonstrate their appropriateness. "Maintenance Rule Program Document," EWI-05.02.01, described the process used to establish performance criteria. Calculation File II.SMN.97.010 documented the linkage between the performance criteria and the PRA assumptions.

The availability performance criteria established were generally higher than the PRA assumptions. The licensee performed a sensitivity study to demonstrate the

appropriateness of the performance criteria, inputting the availability performance criteria into the base PRA. The core damage frequency (CDF) increased from a baseline CDF of 1.3E-5 to 2.8E-5 per year. The licensee considered this acceptable based on the low likelihood of all the SSCs being at their performance criteria limit simultaneously, and that the licensee used the PRA-based equipment out-of-service [EOOS] risk monitor at least quarterly, which provided another means of tracking the risk due to unavailability. The inspectors considered this increase to be reasonable based on the quantitative screening criteria provided in the Electric Power Research Institute (EPRI) PRA Applications Guide (TR-105396) for permanent risk increases.

The licensee established reliability performance criteria at the train level and provided a linkage between the criteria and the PRA assumptions using the statistical methodology provided in EPRI Technical Bulletins 96-11-01, "Monitoring Reliability for the Maintenance Rule," and 97-03-01, "Monitoring Reliability for the Maintenance Rule-Failures to Run." The maximum number of failures were calculated given the PRA failure to run or failure to start probability, estimating the number of demands using historical records, and using a 95 percent confidence level.

In a number of cases, such as feedwater injection check valves, residual heat removal service water pumps, low pressure coolant injection subsystem, 4KV station auxiliary, anticipated transient without a scram (ATWS) system, 125VDC, and an uninterruptible AC power supply; the statistical approach applied to the reliability performance criteria resulted in the performance criteria being set to 0 failures in 2 years. A sensitivity study was performed setting the performance criteria for these components to 1 MPFF per 2 years, except for ATWS, which was established at 2 MPFF per 6 years. Additionally, due to concerns with the air compressors' historical performance, the performance criteria for these components was set at 3 MPFFs per 2 years. The statistical approach would have required the air compressors' performance criteria to be set at 1 MPFF per 2 years. Although the performance criteria used for the air compressors appeared to be high, the licensee explained that this was due to the PRA containing unrealistic failure probabilities for these components. As discussed in the baseline inspection report, the licensee was planning a PRA update. This update will include updated failure and availability probabilities, and was scheduled to be completed in 1999. Additionally, the air compressors were being monitored under (a)(1), with a corrective action plan to improve performance. The sensitivity study also incorporated the proposed unavailability performance criteria. The results of the sensitivity study showed a CDF increase from a baseline of 1.3E-5 to 9.0E-5 per year. As described in the licensee's procedure, the goal was to maintain the CDF below 1E-4 per year. The dominant contributors to this CDF increase were the feedwater check valves and ATWS system. These standby components have very low failure probabilities and very few demands. The MR expert panel reviewed the results of the study and approved the performance criteria. Although a sensitivity study of the performance criteria considering the large early release frequency (LERF) was not performed, the licensee performed a qualitative evaluation and concluded that the LERF was not as sensitive to the changes in failure probabilities as CDF and would be below the goal of 1E-5 per year, by applying scaling factors from the CDF increase. The baseline LERF was 4.5E-7 per year.

The inspectors considered the increase in CDF to be reasonable, and concluded that the availability and reliability performance criteria were appropriately established and based on PRA input.

b.2 Standby SSC Performance Criteria

The baseline inspection identified that specific performance criteria were not established for the following standby components: the primary containment isolation system, the diesel fuel oil standby pump, the reactor building component cooling water standby pump, and the primary radiation monitors. In response to the violation, appropriate reliability performance criteria were established for these low safety significant standby components. In addition, the licensee identified two additional components (the stator cooling system standby pump and standby emergency seal oil pump for the hydrogen seal oil system) that were considered standby components and established appropriate reliability performance criteria.

b.3 Performance Criteria for Low Safety Significant Normally Operating SSCs

The plant level performance criteria established for unplanned engineered safety feature actuations of greater than or equal to 7.5 per year appeared high. The value was initially established based on poor historical performance, however, recent performance indicated an improving trend. The MR coordinator had also been monitoring this trend and indicated that if the trend continued to improve, a change to the performance criteria might be warranted. This was considered acceptable.

b.4 Structures and Structure Monitoring

Surveillance Test 1385, "Periodic Structural Inspection," was used to monitor structures under the MR scope. This procedure, which was recently revised, contained significantly more information of how structural monitoring was integrated into the MR program. The procedure consisted of 18 tables, one for each of the major buildings and 1 table identifying miscellaneous structures. Each of the major building tables was then divided into specific rooms or areas within the building. Then for each room or area structural elements were identified for review, such as floor, ceiling, walls, structural steel, and equipment pedestals. Inspection results were documented as either acceptable, acceptable with deficiencies, unacceptable, or not applicable. Deficiencies were documented on Form 4266, "Structural Deficiency Identification and Evaluation Form," and included in a MR data base. If a structural element was acceptable with deficiencies, the expert panel was required to review the deficiency to determine if the structure would not degrade to the unacceptable level prior to the next inspection period (every 5 years) or the structure classified as 10 CFR 50.65 (a)(1) if the deficiency was not corrected. The procedure also incorporated how deficiencies identified through other existing structural inspection programs were addressed by the MR. These program revisions addressed concerns identified during the baseline inspection.

Several structure baseline inspections, not completed during the 1996 inspections, were conducted using the revised procedure. Deficiencies were adequately documented, including photographs that would be useful for future inspections to determine further structural degradation. Deficiencies were evaluated and resolved based on significance. The licensee, however, identified that additional procedural guidance was needed for evaluating a deficiency's significance to ensure concerns were addressed in a timely manner.

During the baseline structural inspection, the licensee identified the condition of all structures within scope of the MR as acceptable; no deficiencies with structures were documented in the MR program. However, the baseline inspection report documented two structural deficiencies where operability evaluations were in place or structural repairs had been completed that were not addressed in the MR program. One of the deficiencies resulted from an original design deficiency and not from degradation of the structure. The other deficiency had to do with a damaged penetration seal, which if the seal had failed would have been counted as an MFFF for secondary containment versus a structural deficiency. Based on a better understanding of the deficiencies in question, monitoring by the MR structural program was not warranted. The baseline report also stated that inappropriate credit was taken for structural inspections performed in 1986 as part of the baseline inspections. The licensee stated that although these inspection results were used to provide insights as to where structural problems may exist, walk downs were completed for all of the baseline structural inspections conducted in 1996.

c. Conclusions

The performance criteria established were considered acceptable. The unavailability and reliability performance criteria for high safety significant SSCs were adequately linked with the assumptions in the PRA. Standby SSCs were adequately monitored by specific reliability performance criteria. Based on the revisions to the structural monitoring program and a better understanding of how the baseline inspections were conducted, the structural monitoring program was considered acceptable.

M1.3 Inservice Testing (IST) of Relief Valves

a. Inspection Scope

The inspectors reviewed program documents and procedures in order to evaluate the process established to meet the requirements of American Society of Mechanical Engineers, Operation and Maintenance of Nuclear Power Plants Standard, Part 1 (OM-1), when testing IST relief valves under ambient conditions, when the valves were required to function under different operating fluid or temperature (process or surrounding environment) conditions.

b. Observations and Findings

Background

During a previous IST inspection, it was noted that the licensee was bench-testing several relief valves in the residual heat removal system at ambient temperature when the valves would normally experience a higher fluid temperature when they were required to function. This was not in accordance with OM-1987, Part 1, to which the licensee was committed in their IST program. Paragraph 4.1.3.1, Test Media, stated "Valves shall be tested with the normal system operating fluid and temperature for which they were designed. Alternative liquids or different temperatures may be used, provided the requirements of 4.3 are met." Additionally, paragraph 4.1.3.5 stated "The ambient temperature of the operating environment shall be simulated during the set pressure test. If the effect of ambient temperature on set pressure can be established for a particular valve type, then the valve may be set pressure tested using an ambient temperature different from the operating ambient temperature. Correlations between the operating and testing ambient temperatures shall comply with the requirements of paras. 4.3.2 and 4.3.3." The licensee used the cold set-pressure values stamped on the valves' nameplate as a means to meet this requirement. However, the valve vendor was unable to provide test data to justify the correlation used when the valve was stamped, such that a certified correlation, as required by paragraph 4.3, was not available. This issue has become a generic concern in the industry that the Code committee, valve vendors, licensees, and industry groups have attempted to address.

Based on the inspectors' concern, the licensee submitted a Code Inquiry in December 1994 to verify the intent of the Code. A response to the inquiry was received in November 1997 that indicated that the cold set-pressure stamped on a valve was not acceptable to meet Paragraph 4.3 for the certified correlation requirement without test data to justify the cold set-pressure (OMI 94-10). As a result of the inquiry response, the licensee submitted a supplemental response to the NRC unresolved item in February 1998 indicating that the Code committee did not respond to the question asked by the licensee. The licensee also stated the intent of testing a representative valve to verify the vendor's correlation or establish a new certified correlation for the subject valves.

Discussion

The question the licensee attempted to have addressed by the Code committee was, if the valve vendor provided the cold set-pressure value based on licensee supplied set-pressure and maximum inlet temperature, then the cold set-pressure should be considered a design value and bench testing at the cold set-pressure was in accordance with the first sentence of Paragraph 4.1.3.1 and a certified correlation was not required. In other words, the valve was designed to be tested using the cold set-pressure. However, the inspectors noted that if the valve vendor had justification for the cold set-pressure stamped on the valve, then a certified correlation would exist. Since the valve

vendor was unable to justify the cold set-pressure, the valve could not be verified to be designed to test at the cold set-pressure and as such, a certified correlation was required to meet the Code.

During this inspection, the inspectors identified that there were three types of valves affected that needed a certified correlation, those supplied by Crosby, Farris, and Kunkle. The Crosby valves were recently purchased and were supplied with test data under ambient and normal operating temperature. The data indicated for these valves at their normal operating temperature, no adjustment was required when setting the valves under ambient conditions. The licensee sent a Farris valve offsite to be tested to reverify the valve vendor's cold set-pressure correlation or establish a new certified correlation for this valve type. Although testing had been completed, the licensee was still reviewing the data. Based on the scatter of the raw test data, it was unclear to the inspectors whether a correlation could be established. The licensee had not yet dispositioned the Kunkle valves, which were thermal relief valves on the residual heat removal heat exchangers. The licensee was reviewing the condition under which these valves were required to function, to determine if a correlation was required.

c. Conclusions

Although a significant amount of work was performed to ensure compliance with OM-1 for the testing of relief valves, establishment of certified correlations had not yet been sufficiently completed to closed the unresolved item.

M8 Miscellaneous Maintenance Issues (92701)

M8.1 (Open) Unresolved Item 50-263/94008-01(DRS)): This issue concerned the testing of relief valves under conditions other than the valve's normal service conditions such that a certified correlation for the cold set-pressure should have been established as required by OM-1. Based on the discussion in section M1.3 of this report, this issue remains open.

M8.2 (Closed) Violation 50-263/97007-01(DRS): This violation concerned the failure to establish specific reliability or unavailability performance criteria for standby SSCs. Based on the actions discussed in section M1.2.b.2 of this report, this issue is closed.

M8.3 (Closed) Violation 50-263/97007-02(DRS): This violation concerned the failure to establish an acceptable link for the performance criteria to the values assumed in the PRA. Based on the discussion in section M1.2.b.1 of this report, this issue is closed.

M8.4 (Closed) Unresolved Item 50-263/97007-03(DRS)): This issue concerned establishing an adequate structural monitoring program under the MR. Based on the discussion in section M1.2.b.4 of this report, this issue is closed.

M8.5 (Closed) Inspection Follow-up Item 50-263/97007-04(DRS): This issue concerned reviewing the corrective actions from a quality assurance audit and self-assessment not completed prior to the baseline inspection. Based on the inspectors' review of the actions taken for the licensee's self-assessment findings and in conjunction with the corrective actions taken for the maintenance rule baseline inspection findings, this item is closed.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors discussed the progress of the inspection with licensee representatives on a daily basis and presented the inspection results to members of licensee management at the conclusion of the inspection on August 13, 1998. The licensee acknowledged the findings presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary; two documents were identified in the list of documents reviewed.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

P. Ahbores, Superintendent, Mechanical Maintenance
D. Carstens, Core Spray Systems Engineer
J. Fenton, Superintendent, Plant Scheduling
M. Hammer, Plant Manager
M. Lechner, Acting General Superintendent, Operations
C. Nierode, PRA Engineer
J. Pairitz, Maintenance Rule Coordinator
E. Reilly, General Superintendent, Maintenance
P. Riedel, PRA Engineer
M. Voth, Site Licensing
T. Wellumson, PRA Engineer
A. Wojcnouski, Superintendent, Safety Systems Engineering

LIST OF INSPECTION PROCEDURES USED

IP 62706:	Maintenance Rule
IP 73756	Inservice Testing of Pumps and Valves
IP 92701	Followup

LIST OF ITEMS DISCUSSED

50-263/94008-01(DRS)	URI	Relief Valve Set-pressure Correlation per OM-1

LIST OF ITEMS CLOSED

50-263/97007-01(DRS)	VIO	Stand-by SSC Performance Criteria
50-263/97007-02(DRS)	VIO	Reliability/Unavailability PRA Performance Criteria
50-263/97007-03(DRS)	URI	Structure Monitoring Program
50-263/97007-04(DRS)	IFI	Corrective Actions to Quality Assurance and Self-Assessment Findings

LIST OF ACRONYMS USED

ATWS	Anticipated Transient Without Scram
CDF	Core Damage Frequency
DRS	Division of Reactor Safety
EPRI	Electric Power Research Institute
IST	Inservice Testing
LERF	Large Early Release Frequency
MPFF	Maintenance Preventable Functional Failure
MR	Maintenance Rule
OM	Operations and Maintenance
PRA	Probabilistic Risk Assessment
SSC	Structures, Systems or Components

LIST OF DOCUMENTS REVIEWED

EWI-05.02.01, "Monticello Maintenance Rule Program Document," Revision 3, April 9, 1998

Monticello Maintenance Rule System Baseline Document, "Structures," Revision 2, June 6, 1998

Calculation File II.SMN.97.010, PRA Input to the Maintenance Rule Performance Criteria for Monticello, August 13, 1998

Monticello Maintenance Rule Periodic Assessment Reports, 2nd quarter - 1998

Maintenance Support Group Instruction, "Maintenance Rule Coordinator Activities," August 8, 1998

Maintenance Rule Periodic Inspection Summary 1998

Surveillance Procedure 1385, "Periodic Structural Inspection," Rev. 2, April 9, 1998

Maintenance Rule Implementation Self-Assessment Evaluation Report, May 15, 1997

AG 1997-M-2, Audit Summary of Maintenance Rule Activities, May 22, 1997

Letter NSP to NRC, "Reply to Notice of Violation Contained in NRC Inspection Report No. 50-263/97007," dated August 15, 1997

Wyle Test Report No. 46681-0, "Correlation Testing on Farris Relief Valve Model 2741," April 30, 1998 (Proprietary)

Procedure 0255-02-1B, "Relief Valve Setpoint and Leak Checks," Revision 23, May 4, 1998

T-16754, Crosby Valve Test Procedure, Revision 0, June 20, 1997

Procedure 3089, "Section XI Valve Data Sheet," Revision 5, August 20, 1997 (Proprietary)

Farris Engineering Specification MES-635

Condition Report 97002860, "Insufficient Correlation Data Provided for Coldset Thermal Relief Valves in the IST Program," November 11, 1997

Work Order 9703576, "Obtain RV Setpoint Data for OM-1 Correlation"