U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-282/94005(DRS); No. 50-306/94005(DRS)

Docket Nos. 50-282; 50-306 Licenses No. DPR-42; No. DPR-60

Licensee: Northern States Power Company
414 Nicollet Mall
Minneapolis, MN 55401

Facility Name: Prairie Island Nuclear Generating Plant - Units 1 and 2

Inspection At: Red Wing, MN

Inspection Conducted: April 18 through May 6, 1994

Inspectors: Rogelio Mendez for
A. Dunlop — Date: 6/1/94

Rogelio Mendez
R. Mendez — Date: 6/1/94

Approved By: Ronald N. Gardner
R. N. Gardner, Chief
Plant Systems Section — Date: 6/1/94

Inspection Summary

Inspection conducted April 18 through May 6, 1994 (Reports No. 50-282/94005(DRS); No. 50-306/94005(DRS))
Areas Inspected: Announced safety issues inspection of the licensee's incorporation of Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Test Programs," into the Inservice Testing (IST) Program (TI 2515/114), the licensee's program on check valves (TI 2515/110), the licensee's self-assessment in these areas, and follow-up of licensee actions to previously identified inspection items.
Results: One violation was identified during the inspection concerning the failure to adequately implement Code requirements. These included failure to perform pump testing at an established reference value (Paragraph 2.c.(1)), failure to implement corrective actions for valve seat leakage (Paragraph 2.d.(1)), and failure to establish adequate acceptance criteria to full flow test several check valves (Paragraph 2.d.(2)). One inspection follow-up item (IFI) was identified concerning the weakness associated with the development and implementation of an adequate check valve program as recommended by SOER 86-03 (Paragraph 3). Based on this inspection, TI 2515/114 and TI 2515/110 are considered closed.

The inspection identified the following strengths and weaknesses:

- Check valve program implementation was considered weak based on not performing a design application review and developing a preventive maintenance program as recommended by SOER 86-03.

- The ASME Code Section XI requirements were not adequately implemented in all cases.

- The use of non-intrusive testing techniques to verify check valve disc position for IST was considered good.

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DETAILS

1. Persons Contacted

Northern States Power Company

M. D. Wadley, Plant Manager
*K. J. Albrecht, General Superintendent Engineering
*B. Fraser, Superintendent Technical Programs
*M. H. Carlson, Engineer, Check Valve Program
D. W. Carlson, Engineer, Inservice Test Program
*J. Hoffman, Engineer
*M. R. Heller, System Engineer
*J. Leveille, Licensing Engineer
*G. L. Miller, Engineer
*R. Stenroos, Quality Engineer

Additional plant and corporate personnel were contacted during the inspection.

U. S. Nuclear Regulatory Commission (NRC)

M. Dapas, Senior Resident Inspector
*R. Bywater, Resident Inspector

*Denotes those personnel attending the exit meeting on May 6, 1994.

2. Inservice Testing (IST) of Pumps and Valves

The inspectors reviewed IST procedures and completed IST surveillances. Generally, the methods used for the testing of pumps and valves were adequate. The test frequencies and acceptance criteria were specified and provisions were made for prompt operability determinations. Areas reviewed are discussed below.

a. Implementation of the Third 10-Year IST Program

The program was in a state of transition since a new 10-year IST cycle was recently begun on unit 1. The third 10-year program was based on the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (the Code), Section XI, 1989 Edition, which implemented the requirements of O&M Parts 1, 6, and 10. The program was implemented on December 16, 1993, for unit 1 and was scheduled for implementation on December 21, 1994, for unit 2. NRC issued a Safety Evaluation Report (SER) that contained a significant number of comments and questions concerning the program. The majority of the comments concerned insufficient documentation to support the submittal. The licensee was actively pursuing these issues to provide a revised IST program submittal later this year. Based on a limited review, the draft program submittal still required significant attention to address the comments in the SER. The submittal process was also developing an IST basis document, which should define safety functions and appropriate design acceptance criteria

for the components included in the program. This document will provide a good understanding of how the program was developed and the requirements for performing the test program.

Test procedures for unit 1 were not in all cases revised to reflect the O&M Code requirements. Quarterly tests for Unit 1 were conducted via the work request process (temporary procedures) prior to revising test procedures. The work request process successfully tested components in accordance with the O&M requirements. Several updated test procedures were reviewed and found to adequately test components per the O&M requirements. The updated test procedures were more comprehensive than previously used revisions.

Although in most cases the program was being adequately implemented, there was a significant amount of work yet to be completed. This included preparing the IST program submittal, developing a basis document, revising test procedures, and the normal maintenance of the program. It appeared that having only a part time IST coordinator at this time may not be sufficient to accomplish the required tasks.

b. Scope

The scope of the licensee's IST Program was considered good. Selected plant systems were reviewed to ensure program scope was in accordance with ASME Code requirements. Technical Specifications (TS), Updated Final Safety Analysis Report (UFSAR), NRC Safety Evaluation Report (SER), and Emergency Operating Procedures (EOPs) were also reviewed to evaluate the program scope. No components were identified that would require inclusion into the IST program.

The SER issued December 8, 1993, identified a number of valves that appeared to have a safety function requiring inclusion in the program. The draft program submittal indicated that the majority of these valves will be included in the new program. Several valves were still under review to determine if safety function existed requiring their inclusion. Resolution of this issue will be based on the new program submittal and subsequent SER. Since there are other systems that have not been reviewed, the basis document development may also identify other valve safety functions that would require testing.

Licensee Event Report (LER) 93-007 contained a number of valves with safety functions that should have been included in the IST program. This item is addressed in Paragraph 5.a of this report.

c. Pump Testing

Generally, testing of pumps in the licensee's IST program was performed in accordance with ASME Code requirements and the recommendations of Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs." Issues noted during the inspection are discussed below:

(1) The residual heat removal (RHR) quarterly pump test was not performed in accordance with the Code. The Code required establishing pump flow rate or differential pressure (d/p), waiting 5 minutes, and then measure d/p, flow rate, and vibration. The test, however, was conducted by starting the pump, recording flow rate for information only, waiting 15 minutes, and then d/p and vibration measurements were taken as IST data. The flow rate was assumed to be constant based on no adjustments to the recirculation line, which provided the flow path for the pump. The licensee indicated the recirculation line was not instrumented based on the flow rate meter not meeting the 2% of full scale Code accuracy requirement of IWP-4110. The technical manual for the Barton flow instrument (DPI Model 227A), however, indicated an accuracy of 3/4% of full scale, well within the Code limit. The accuracy of the flow instrument was not adequately reviewed by the licensee to determine whether the Code requirements were met. Failure to perform testing in accordance with the Code is considered a violation of TS 4.2.A.2 and IWP-3100 (282/306/94005-1a(DRS)).

Numerous test results indicated the RHR flow rate was outside the normal expected range identified in the procedure, although the anomaly was not addressed. Even though the flow rate was not considered an IST requirement during the test, discretion should have alerted the reviewer to investigate and correct the discrepancy.

(2) The inspectors identified concerns with auxiliary feedwater (AFW) pump testing.

- On February 22, 1992, the turbine driven auxiliary feedwater (TDAFW) pump failed the full flow surveillance test performed during the refueling outage. Although, the pump met the flow requirements, the pump failed to meet the required speed and the d/p action range of greater than 1245 psi at 200 GPM. The preliminary investigation concluded that the full flow test was performed at a steam generator (SG) pressure of 665 psi, which was less than SG pressure at 100% power. The licensee assumed that the poor pump performance could be corrected by performing the test at the 100% power SG pressure of 700 psi. No additional tests or evaluations were performed. The licensee changed the procedure to establish a minimum SG pressure of 700 psi when performing the pump surveillance.

  On October 25, 1993, the TDAFW pump again failed the surveillance test. The test was performed at a SG pressure of 700 psi; however, the pump failed to meet the required speed and the d/p action range. Subsequently, the licensee performed a series of tests to establish a minimum pressure to perform the Unit 2 TDAFW pump surveillance. The licensee found that at a

SG pressure of greater than 800 psi, there was no appreciable drop in the TDAFW pump discharge pressure or speed.

Although the licensee's final corrective actions were adequate, the initial corrective action taken to establish a minimum SG pressure of 700 psi was not based on actual calculations or testing to demonstrate that the pump had not degraded.

- The reference values for the auxiliary feedwater (AFW) pumps were established from the manufacturer pump curves and not from actual testing. The Code states that reference values shall be determined from the results of an inservice test run during preoperational testing or from the first inservice test run during power operation. The licensee agreed to compare the present expected pressures and acceptable ranges with actual testing during future tests.

- Incorrect reference values for the expected d/p were used in the monthly and refueling outage test procedures for the unit 2 TDAFW pump. The licensee used an incorrect d/p of 1650 psi instead of the required pressure of 1701 psi. In addition, the values listed for the expected, alert, and action pressure ranges were based on 1650 psi and were incorrect. The inspectors determined that the incorrect values did not affect operability. The procedures will be revised to incorporate the correct values.

- Flow instruments were used in the refueling outage test procedures for the AFW pumps to provide acceptance criteria for flows greater than 200 GPM. However, the maximum measurable flow rates of the instruments was 200 GPM. The licensee stated that reference to the above instrument would be removed from the procedures since other instruments referenced in the procedure could be used to measure flow rates greater than 200 GPM.

- The tachometers used in measuring the overspeed trip of the unit 1 and unit 2 TDAFW pumps were accurate to only the nearest 100 RPM, although the acceptance criteria was to the nearest 10 RPM (3790-4110 RPM). The licensee stated more accurate tachometers will be used in the future.

d. Valve Testing

In most cases, the guidance of GL 89-04 was incorporated into the IST program for valves. The following issues were identified during the inspection.

(1) Local leak rate tests (LLRTs) did not require containment isolation valves (CIVs) to be repaired or replaced when the leak rate limit was exceeded as required by IWV-3427. CIVs were tested by 10 CFR 50, Appendix J, which was approved by a relief request for the second 10-year cycle. The relief request was considered acceptable based on performing the actions specified in IWV-3426 and IWV-3427. These actions included establishing a leak rate acceptance criteria, trending the results, and taking corrective actions when the acceptance criteria was exceeded. No corrective actions were taken when leak rates exceeded the 0 SCC/minute maximum desired leak rate limit identified in the LLRT procedure for the containment sump suction line isolation to RHR pump valves. The LLRT results for the last refueling outage for each unit were as follows:

VALVE	LEAK RATE
MV-32075	4800 SCC/minute
MV-32076	565 SCC/minute
MV-32178	1800 SCC/minute
MV-32179	60 SCC/minute

Failure to take corrective actions when the leak rate exceeded the maximum desired leak rate in the test procedures is considered a violation of TS 4.2.A.2 and IWV 3427 (282/306/94005-1b(DRS)).

The licensee was using the Appendix J acceptance criteria of 0.6 La, which was based on leak rates for the entire containment, while IST requirements were established for individual valves. As such, the established maximum desired leak rate was only a guide in the test and actual acceptance was based on the 0.6 La. By not including reasonable acceptance criteria and performing corrective actions when the criteria was exceeded, the relief request was not adequately implemented . This issue not only affects the valves identified above, but all CIVs tested per Appendix J. Although O&M 10 allows the testing of CIVs by Appendix J, 10 CFR 50.55a(b)(2)(vii) required the additional actions in O&M sections 4.2.2.3(e) and 4.2.2.3(f) to be taken for performing corrective actions when established acceptance criteria was exceeded. This issue needs to be addressed for the upcoming outage on unit 1 to ensure compliance with the Code.

(2) The test procedures were not adequate to verify the open safety function for the refueling water storage tank (RWST) to RHR pump suction check valves (SI-7-1 and SI-7-2). GL 89-04 stated one positive means to verify check valves fully opened was by passing the maximum accident flow through the valve. This flow was determined to be 1800 gpm; however, the acceptance criteria in the test procedure was 1500 gpm, which would only be considered a partial stroke. Failure to provide adequate acceptance criteria to full flow

test the check valves is considered a violation of TS 4.2.A.2 and IWV-3522 (282/306/94005-1c(DRS)).

This was not an operability issue as the previous test results indicated RHR flows exceeded the 1800 gpm requirement. As such, although the test procedure was in error, the valves were adequately tested.

(3) Several test procedures did not establish acceptance criteria for full flow testing and back flow testing of check valves. Even though the test procedures were not specific, the required testing appeared to be accomplished. This issue had been identified by the licensee and was being addressed as procedures were updated to the O&M requirements. A review of several revised procedures indicated this action was being accomplished.

(4) Non-intrusive testing (NIT) was being used to verify check valves were full open in some cases. Due to the high maximum accident flow rates for certain valves that prohibit full flow testing, NIT techniques were used to verify the open safety function of select valves including the accumulator discharge check valves. Use of this technique eliminates the need to disassemble/inspect (D/I) valves by providing a positive means of verifying the valve disc fully opens without maximum flow. This was considered a good approach in performing IST of check valves.

e. Trending

The IST coordinator maintained a computer database of all pumps and valves in the IST program to trend pump and valve performance. Graphic representation of the data allowed easy interpretation and comparison of test results to the appropriate alert and required action ranges.

f. Test Observations

The inspectors witnessed the testing of the unit 1 safety injection (SI) pumps and the stroke timing of several SI motor operated valves. The test procedure was properly followed, test equipment was in calibration, and the test was conducted in a professional manner. No concerns were identified.

3. Check Valve Program

The licensee did not follow recommendations in SOER 86-03, "Check Valve Failures or Degradation," to perform a design application review of check valves and establish a testing and preventive maintenance program to identify valve degradation. It appeared that management did not provide the necessary oversight to assure a well developed program. This weakness will be considered an inspection follow-up item (IFI) (282/306/94005-02(DRS)).

a. Scope

The scope of the check valve program was defined in a computer program data base and included almost all check valves in the plant (approximately 1000 valves). Valves not included were considered skid mounted without a specific valve designation, although they may perform a safety-related function. Administrative procedure, H12, "Plant Check Valve Program," described the process for how the program should be developed and implemented. The process for performing the design application review was not followed and a preventive maintenance program has not yet been developed.

b. Design Application Review

SOER 86-03 recommended establishing a check valve program. This included performing a design application review of check valves to certain criteria as explained in EPRI report NP-5479, "Application Guidelines for Check Valves in Nuclear Power Plants," to determine which check valves were more susceptible to degradation. These criteria included valve orientation, up and downstream flow disturbances, minimum flow velocity calculations, valve sizing, valve material, and valve maintenance history. This did not appear to have been performed. No walk downs of check valves were performed to determine valve orientation and flow disturbances. Although minimum flow calculations were performed, they did not take into account attributes necessary to obtain adequate results. For example, the equations in the EPRI document do not take into account valve orientation and upstream disturbances, which affect the results. These corrections were addressed in the EPRI document, but not incorporated into the minimum flow velocity calculations. Since the results of these calculation did not appear to be used, their inaccuracies caused no adverse effects.

c. Preventive Maintenance

Based on the design application review, a preventive maintenance program for check valves was to be developed. This should include testing, non-intrusive testing, and sample D/I. No sampling program has been established for D/I and NIT. Testing was being accomplished by the IST program and other additional test on selected valves to verify operability.

D/I was performed on valves when the SOER was issued; however, this was not ccntinued based on not identifying problems. A review of D/I results indicated that although valve failures may not have been identified, degradation of valve internals were identified. This included a cracked disc, bent hinge pin, and internal corrosion.

Several problem valves were identified (e.g., duo disc valves in the cooling water system) where schedules were established for repair or replacement. The development of this type of preventive maintenance was the driving force behind the SOER and NRC concern with check valve problems in the industry. Establishing a program

Maintenance procedure D72, "Check Valve Program Disassembly and Inspection Procedures," was sufficiently comprehensive to conduct D/I; however, several deficiencies were identified as follows:

- The verification of free disc movement was not always performed in the as-found condition. Other inspections performed prior to the free disc movement verification compromises the as-found results. This would be of concern when D/I was used in the IST program to meet Code exercising requirements. The discs' as-found condition should be determined and if additional maintenance was required to further disassemble the valve, an as-left verification of free disc movement should be performed prior to installing the valve bonnet.

- In some cases there was no requirement for documenting inspection results for each internal component of the valve. Documenting the condition of components enhances the ability to predict valve degradation.

- In some cases the component described was incorrect. A quality control inspector identified one discrepancy that was documented in the completed procedure, but not corrected during subsequent revisions to the procedure.

4. Licensee Self-Assessment

The licensee's implementation of quality assurance (QA) audits in the IST area was adequate. The inspectors determined that the licensee's audit reports were performance based, assessed procedural adherence and identified some significant concerns. Findings included the identification of valves with safety functions that were not in the IST program and check valves that were not reverse flow tested. However, as documented in this report, the inspectors identified weaknesses with implementation of the IST program that were not identified by the licensee. The inspectors' findings indicate that continued oversight, by line management, may be warranted in order to identify and correct any additional problems in the IST area to comply with the code.

5. Follow-up of Previously Identified Inspection Items

a. (Closed) Unresolved Item (50-282/93008-04). This item concerned a number of valves with safety functions that were not included in the IST program. These valves were identified by the licensee and documented in LER 282/93-007. The valves were added to the IST program and testing was commenced as required by the Code. Upon a further review the licensee identified that two valves did not perform a safety function and were deleted from the program. In addition, several other valves were determined to be "passive" that would not have required their inclusion under the 1980 Edition of the Code. The licensee committed to revise the LER to clarify the identified commitments. The corrective actions taken were acceptable and this item is considered closed.

clarify the identified commitments. The corrective actions taken were acceptable and this item is considered closed.

b. (Closed) IFI (282/93007-01; 306/93007-01(DRS)). During discharge testing of station batteries, the licensee's practice was to transfer DC loads to the same train battery of the other unit. The battery calculations did not account for the additional loading imposed on the battery of the other unit when a station battery was discharge tested. The licensee subsequently issued temporary memo No. TM-94-40 to prevent transfer of battery loads between units. During this inspection, the licensee stated that a final decision had not been made whether to keep or remove the load transfer capability. However, the inspectors determined that adequate controls were in place to prevent future transfer of battery loads. This item is considered closed.

c. (Closed) Unresolved Item (282/93007-02; 306/93007-02(DRS)). The licensee lacked an analyses to demonstrate tornado qualification of the emergency diesel generator (EDG) room ventilation dampers. The UFSAR assumed a tornado induced depressurization of 3 psi. On September 3, 1993, the licensee completed NSP calculation No. ENG-CS-027, which evaluated the integrity of the inlet and exhaust dampers for the effects of tornado induced depressurization. The calculations demonstrated the dampers would maintain structural integrity during a tornado induced depressurization of 3 psi. This item is considered closed.

The inspectors also reviewed programmatic weaknesses and issues identified during the electrical distribution functional inspection (EDSFI). Although corrective actions concerning the identified weaknesses were not complete, the inspectors determined that the licensee had taken a proactive approach in resolving the EDSFI issues.

6. Inspection Follow-up Items

Inspection follow-up items are matters which have been discussed with the licensee which will be reviewed further by the inspector and which involve some action on the part of the NRC or licensee or both. One inspection follow-up item was identified during this inspection and is described in Paragraph 3.

7. Exit Meeting

The inspectors met with licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on May 6, 1994. The inspectors summarized the purpose, scope and findings of the inspection and discussed the likely informational content of the inspection report. The licensee identified none of the documents or processes reviewed by the inspectors during the inspection to be proprietary.