June 5, 1998

Mr. M. Wadley, Vice President
Nuclear Generation
Northern States Power Company
414 Nicollet Mall
Minneapolis, MN 55401

SUBJECT: PRAIRIE ISLAND INSPECTION REPORT 50-282/98007(DRP); 50-306/98007(DRP); AND NOTICE OF VIOLATION

Dear Mr. Wadley:

On May 11, 1998, the NRC completed an inspection at your Prairie Island Nuclear Generating Plant. The enclosed report presents the results of that inspection.

During the six-week period covered by this inspection, several problems were identified with engineering activities including engineering support to maintenance, surveillance testing, and operations activities. Some of the issues were identified by the plant staff, but others were identified by the NRC. Violations of regulatory requirements were identified concerning two instances of failure to promptly correct conditions adverse to quality, two instances of procedures that did not contain enough information to ensure successful performance of maintenance and testing activities, and one instance of failure to develop testing for a safety-related system that was installed over 2 ½ years ago. In addition, weaknesses were identified in the Individual Plant Examination submittal and the computerized equipment database. Three unresolved items concerning equipment operability, Technical Specification compliance, and performance of a safety evaluation were identified which may be considered violations of regulatory requirements when more information becomes available. All of the issues, taken together, raise a concern on the part of the NRC regarding the quality of engineering and engineering support at the facility.

The violations are cited in the enclosed Notice of Violation (Notice), and the circumstances surrounding the violations are described in detail in the enclosed report. Please note that you are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. The NRC will use your response, in part, to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

In the response, we also request that you include the results of your revised evaluation of whether the temporary modification installed for the cooling water strainer backwash valves constitutes an unreviewed safety question.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response will be placed in the NRC Public Document Room.

Sincerely,

Original signed by
Marc L. Dapas for

Geoffrey E. Grant, Director
Division of Reactor Projects

Docket Nos.: 50-282; 50-306
License Nos.: DPR-42; DPR-60

Enclosures: 1. Notice of Violation
2. Inspection Report
50-282/98007(DRP);
50-306/98007(DRP)

cc w/encls: Plant Manager, Prairie Island
State Liaison Officer, State
of Minnesota
State Liaison Officer, State
of Wisconsin
Tribal Council
Prairie Island Dakota Community

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# NOTICE OF VIOLATION

Northern States Power Company
Prairie Island Nuclear Generating Plant

Docket Nos.: 50-282; 50-306
Licenses Nos.: DPR-42; DPR-60

During an NRC inspection conducted from March 29 to May 11, 1998, violations of NRC requirements were identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," NUREG-1600, the violations are listed below:

1. Criterion XVI, “Corrective Action,” of Appendix B of 10 CFR Part 50 requires, in part, that measures be established to assure that conditions adverse to quality are promptly identified and corrected.

   Contrary to the above, on March 23 and 24, 1998, the licensee identified and took corrective actions for concerns with the potential effects of flooding from a feedwater line break on the ability of the main steam isolation valves to close. However, the licensee failed to identify or take corrective actions for the potential effect of flooding on a main steam isolation valve junction box in the room adjacent to the Unit 2 loop A main steam isolation valves, a condition adverse to quality, until the concern was identified by the NRC on April 22, 1998.

   This is a Severity Level IV violation (Supplement I).

2. Criterion V, “Instructions, Procedures, and Drawings,” of Appendix B of 10 CFR Part 50 requires, in part, that activities affecting quality be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances.

   Contrary to the above, on April 30, 1998, Surveillance Procedure SP 1306, “D2 Diesel Generator Functional Test,” Revision 3, a procedure for a Technical Specification-required test affecting quality, was not appropriate to the circumstances because it did not contain adequate isolation instructions to prevent an inadvertent start attempt of the diesel engine.

   This is a Severity Level IV violation (Supplement I).

3. Criterion V, “Instructions, Procedures, and Drawings,” of Appendix B of 10 CFR Part 50 requires, in part, that activities affecting quality be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances.

   Contrary to the above, on February 9 and 10, 1998, Work Orders 9800533 and 9800534 for the installation of auxiliary feedwater system flow element orifice plates, an activity affecting quality, were not appropriate to the circumstances because the work orders did not contain adequate instructions to ensure the proper orientation of the orifice plates. As a result, the orifice plates were installed backwards.

   This is a Severity Level IV violation (Supplement I).

4. Criterion XVI, “Corrective Action,” of Appendix B of 10 CFR Part 50 requires, in part, that measures be established to assure that conditions adverse to quality are promptly identified and corrected.

   Contrary to the above, inadequate acceptance criteria, conditions adverse to quality, were identified in May 1987 in Surveillance Procedures SP 2101, “21 Motor-Driven Auxiliary Feedwater Pump Once every Refueling Shutdown,” Revision 26, and SP 2103, “22 Turbine-Driven Auxiliary Feedwater Pump Once every Refueling Shutdown,” Revision 29, and were still not corrected when the procedures were used on March 4 and 5, 1998.

   This is a Severity Level IV violation (Supplement I).

5. Criterion XI, “Test Control,” of Appendix B of 10 CFR Part 50 requires, in part, that a test program be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. The test program shall include, as appropriate, proof tests prior to installation, preoperational tests, and operational tests during nuclear power plant operation.

   Contrary to the above,

   a. on October 3, 1995, preoperational testing of a safety-related backup air supply for the air-operated valves in the cooling water system strainers, installed per Temporary Modification 95P047, did not include testing of the check valves which would be required to isolate the backup system from the nonsafety-related instrument air system during a loss of instrument air pressure, and

   b. as of May 11, 1998, the test program for the safety-related backup air supply did not include operational tests, and operational tests had not been conducted since the preoperational testing.

   This is a Severity Level IV violation (Supplement I).

Pursuant to the provisions of 10 CFR 2.201, Northern States Power Company is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555, with a copy to the Regional Administrator, Region III, and a copy to the NRC Resident Inspector at the facility that is the subject of this Notice, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. If an

adequate reply is not received within the time specified in this Notice, an order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001.

Because your response will be placed in the NRC Pubic Document Room (PDR), to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be placed in the PDR without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.790(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

Dated at Lisle, Illinois
this day of June 1998

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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|---|---|
| Docket Nos: | 50-282; 50-306 |
| License Nos: | DPR-42; DPR-60 |
| Report No: | 50-282/98007(DRP); 50-306/98007(DRP) |
| Licensee: | Northern States Power Company |
| Facility: | Prairie Island Nuclear Generating Plant |
| Location: | 1717 Wakonade Drive East<br>Welch, MN 55089 |
| Dates: | March 29 through May 11, 1998 |
| Inspectors: | S. Ray, Senior Resident Inspector<br>P. Krohn, Resident Inspector<br>S. Thomas, Resident Inspector |
| Approved by: | J. W. McCormick-Barger, Chief<br>Reactor Projects Branch 7 |

EXECUTIVE SUMMARY

Prairie Island Nuclear Generating Plant, Unit 1 and Unit 2
NRC Inspection Report 50-282/98007(DRP); 50-306/98007(DRP)

This inspection included aspects of licensee operations, maintenance, engineering, and plant support. The report covers a six-week period of resident inspection.

Operations

- All operations activities observed were conducted well. Operators rapidly identified and responded properly to several turbine control valve problems and a problem with volume control tank level instrumentation. (Section O1.1)

- Licensee corrective actions for potential flooding of the Unit 2 main steam isolation valve rooms, a self-identified condition adverse to quality, were not thorough because engineers failed to promptly identify or correct an equipment operability concern due to the potential flooding of an adjacent room. This was a violation of Criterion XVI, "Corrective Action," of Appendix B, 10 CFR Part 50. (Section O2.1)

- The licensee's Individual Plant Examination did not fully identify the effects of raw water (cooling water, circulating water, or fire protection water) line breaks in the screenhouse basement because the examination failed to recognize that flooding of the area could result in inoperability of the motor starter disconnect switches of the fuel oil transfer pump for the diesel-driven cooling water pumps. The safety significance was mitigated by the ability to fill the diesel day tanks from other safety-related, independent fuel oil supplies. (Section O2.2)

- An outplant operator had insufficient knowledge of the location of auxiliary equipment for the D5 emergency diesel generator and failed to use self-checking techniques when verifying that precautions and limitations for a surveillance test were met. (Section O4.1)

Maintenance

- All of the ten maintenance and surveillance test activities observed were performed well with only two minor self-checking errors noted. One was identified by a licensee quality services inspector and the other by the NRC inspectors. Safe work practices and proper procedure use and adherence were also noted. Communications between the workers in the field and the control room were good. One minor procedure weakness was identified in that a surveillance test procedure did not contain tolerances for test data. (Section M1.1)

- Safety-related and nonsafety-related backup air accumulators for air-operated valves in Unit 1 and Unit 2 were maintained well and met design, functional, and performance requirements. One minor error was noted in the design basis document describing the safety-related backup air accumulators for the containment vacuum breaker valves. Two more minor discrepancies were noted in the configuration documentation contained in a computerized database for the nonsafety-related portions of the backup air accumulator system. (Section M2.1)

- A procedural deficiency and poor communications between electrical maintenance supervisors and operations personnel contributed to the inadvertent rolling of the D2 emergency diesel generator during electrical post-maintenance testing. Specifically, the test procedure did not provide instructions for ensuring that mechanical portions of the diesel system were properly isolated. This was a violation of Criterion V, "Instructions, Procedures, and Drawings," of Appendix B, 10 CFR Part 50. (Section M3.1)

- The lack of clear direction to maintenance personnel reinstalling auxiliary feedwater flow orifices led to the orifices being installed backwards. The work order step for orifice reassembly did not provide instructions or refer to the drawing containing the proper orientation of the orifice plates. This was a violation of Criterion V, "Instructions, Procedures, and Drawings," of Appendix B, 10 CFR Part 50. Maintenance personnel also demonstrated the lack of a questioning attitude concerning proper orifice orientation by either not noticing or fully considering the implications of the word "Inlet" stamped on the orifice face and not referring to drawings describing correct system configurations. (Section M3.3)

- The failure to update auxiliary feedwater refueling surveillances with revised acceptance criteria resulted in performance of two surveillance tests with the wrong acceptance criteria. This was a violation of Criterion XVI, "Corrective Action," of Appendix B, 10 CFR Part 50. It also resulted in a missed opportunity to identify improperly installed flow orifice plates in the system. A weakness in the licensee's administrative control program was also revealed in that there was no guidance for placing procedures in quarantine until necessary procedure revisions were completed. (Section M3.4)

Engineering

- Several deficiencies were identified with engineering support for equipment operability issues or maintenance and surveillance testing activities. Taken together, the findings raised a concern on the part of the NRC with the quality of engineering support at the facility. (Section E2.1)

- Although Temporary Modification 95T047, which added a safety-related backup instrument air supply for operation of the cooling water strainer backwash valves, had been in place for over two and one half years, it had not been replaced by a permanent modification nor had periodic test or inspection procedures been developed to verify its proper operation. This was a violation of Criterion XI, "Test Control," of Appendix B, 10 CFR Part 50. (Section E3.1)

Plant Support

- The two air ejector radiation monitor check sources (containing nine microcuries of Cesium-137 in each source) were not included in the annual radioactive source inventory lists. Even though the sources contained exempt quantities of Cesium-137, the radiation protection department had made a common practice of including all sources on the annual inventory lists for control and tracking purposes. (Section R3.1)

## Report Details

Summary of Plant Status

Both Unit 1 and Unit 2 operated at or near full power for the entire inspection period.

## I. Operations

### O1 Conduct of Operations

O1.1 General Comments

a. Inspection Scope (Inspection Procedures (IPs) 71707, 92901)

The inspectors conducted frequent reviews of plant operations. The reviews included observations of control room evolutions, shift turnovers, pre-job briefings, communications, control room access management, logkeeping, control board monitoring, and general control room decorum. Updated Safety Analysis Report (USAR), Section 13, "Plant Operations," Revision 15, was reviewed as part of the inspection.

b. Observations and Findings

The inspection period was characterized by routine, full power operation on both units with few operational challenges. Two unusual issues which required some operator action are described below.

- On April 12, 1998, the Unit 2 reactor operator noted that a small deviation was developing between volume control tank (VCT) Level Channels 112 and 141. The channels each controlled various functions such as automatic VCT makeup, letdown diversion to the holdup tank, alarms, and automatic switching of charging pump suction from the VCT to the refueling water storage tank. Operators inspected the detectors and noted a very small leak on one of the sensing lines. Even though the operators believed they knew which detector was deviating from actual level, they tried to control VCT level such that the reading on both detectors would stay in the normal operating band. That activity became more and more difficult as the deviation slowly increased. A work request was promptly generated to repair the leaking detector.

  Instrument and controls (I&C) technicians investigating the problem the next day determined that both level detectors had small leaks and both were indicating inaccurately. One was indicating too high and the other too low. The one operators had thought was deviating was actually the closest to actual level. Therefore the action by the operators to maintain level so that both detectors were indicating within the normal operating range was conservative and prevented the actual level from deviating out of the normal control band.

The more inaccurate detector was replaced on April 15, 1998, and the other detector was replaced two weeks later after the necessary parts became available.

- Toward the end of this inspection period, an anomaly, which caused the Unit 1 turbine control valves to drift, reoccurred a number of times. In each case, operators were quick to identify the problem and take compensatory actions.

  The operators and system engineer discovered that the onset of drift problems could be verified by monitoring for a divergence between the Governor Valve Auto (GVAA21) and Auto Governor (29 AGZ1) signals. Operators placed real-time plots for the two signals on a computer screen near the turbine control panel to help them predict and identify when the drifting would start. When the signals were noted to be diverging, or control valve drifting was noted, operators would briefly place the turbine controls in manual. The divergence between the signals was then corrected by taking turbine control momentarily to "imp-in" and then back to "imp-out" modes of operation.

  The inspectors discussed the control valve drift issue with the system engineer responsible for the turbine control system. The system engineer stated that the anomaly was probably caused by a difference in potential gradually building up across an amplifier located in the governor valve control circuit. The system engineer said that it was difficult to pinpoint the problem due its intermittent nature and that most attempts to troubleshoot the problem resulted in discharging the built-up potential which eliminated the cause of the divergence. He also related that there were ongoing discussions with Westinghouse turbine control specialists in an attempt to determine the cause of the potential buildup and that the electrical grounding of the turbine control cabinets for both units would be improved during future outages.

  The issue with unexpected drifting of the turbine control valves, resulting in the need for operator action, was considered an "operator workaround" and has been tracked by the licensee for a long time. Prior corrective actions seemed to have eliminated the problem until these recent incidents. Although diagnosing the exact cause of the problem has been difficult, adequate engineering attention was being applied to its resolution.

c. Conclusions

All operations activities observed were conducted well. Operators rapidly identified and responded properly to several turbine control valve problems and a problem with volume control tank level instrumentation. One instance of inadequate knowledge and self-checking on the part of an outplant operator is discussed in Section O4.1 of this report.

## O2 Operational Status of Facilities and Equipment

O2.1 Inadequate Corrective Actions for Internal Flooding Concern

a. Inspection Scope (IP 93702)

On March 23, 1998, the licensee reported in accordance with 10 CFR 50.72 that it had identified a condition where a feedwater line break in Unit 1 could disable the ability to close the main steam isolation valves (MSIVs). The Unit 1 MSIVs were declared inoperable for a short period of time until interim compensatory actions were taken. On March 24, 1998, the licensee reported a similar condition on Unit 2 and declared the Unit 2 MSIVs inoperable until interim compensatory actions were taken. The inspectors reviewed the findings and associated corrective actions. As part of the inspection, the following documents were reviewed:

- USAR Section 14.4.10, "Loss of Normal Feedwater," Revision 14;
- USAR Section 14.5.5, "Rupture of a Steam Pipe," Revision 14;
- USAR Appendix I, "Postulated Pipe Failure Analysis Outside of Containment," Revision 14; and
- Licensee Event Report (LER) 1-98-05, "Inoperability of Actuation Logic for Main Steam Isolation Valves in Certain Flooding Conditions from a Feedwater Line Break."

b. Observations and Findings

The licensee described the findings and immediate corrective actions in LER 1-98-05, dated April 22, 1998. The concern described was a high energy line break of a feedwater line which could have resulted in flooding of the Unit 1 loop A MSIV room and submergence of the MSIV solenoid valves and junction boxes. The Unit 1 loop B MSIV could also have been affected since some of the wiring for its controls were in the same junction boxes. One of the two main feedwater lines was located in a room above the loop A MSIVs for both units and grating on the floor could have allowed flooding of the partially enclosed MSIV rooms below. The solenoid valves and junction boxes in the MSIV rooms were not designed for submergence and the flooding could disable the ability of the licensee to close the valves. The MSIVs were listed as required equipment for a feedwater line break in Table I.4-1 of Appendix I of the USAR. Assuming a concurrent failure of the nonsafety-related atmospheric steam dumps, turbine control system, or other steam system components; failure of the MSIVs to close could result in an uncontrolled steaming rate and reactor coolant system cooldown with a resulting positive reactivity addition.

The licensee's immediate corrective actions were to block open doors in the Unit 1 MSIV room and remove a ventilation duct in the Unit 2 MSIV room. Those actions precluded the possibility of water building up to significant levels in the MSIV areas. Additional investigations were being conducted by the licensee and permanent corrective actions were being developed as discussed in the LER.

During the inspectors' review of the event, the inspectors noted that a Train A junction box for the Unit 2 MSIVs was located in a room adjacent to the loop A MSIVs. During an Operations Committee discussion on April 22, 1998, the inspectors learned that the

licensee had assumed that the junction box would not be affected by a feedwater line break. Licensee engineers had assumed that flooding of the adjacent room was not credible because most of the water from the postulated break would enter the MSIV room and openings in the floor of the adjacent room would be sufficient to prevent water buildup. The inspectors pointed out that the adjacent room was open for access from above and the postulated feedwater line break could dump large amounts of water into the room if the break flow happened to be directed toward the access. The openings in the floor were quite small. Licensee engineers then inspected the room and confirmed with preliminary calculations that the adjacent room could flood and submerge the junction box. The licensee blocked open the doors between the room with the junction box and the loop A MSIVs to prevent a potential water buildup during a feedwater line break.

On March 23 and 24, 1998, the licensee identified concerns with the potential effects of flooding from a feedwater line break on the ability of the MSIVs to close. The licensee took immediate interim corrective actions. However, the licensee failed to promptly identify or take corrective actions for the potential effect on an MSIV junction box in the room adjacent to the Unit 2 loop A MSIV until the concern was identified by the inspectors on April 22, 1998. This was a violation of 10 CFR Part 50, Appendix B, Criterion XVI, which required that measures be established to assure that conditions adverse to quality are promptly identified and corrected (50-306/98007-01(DRP)).

Since the junction box identified by the inspectors affected only Train A of the two redundant control circuits for the Unit 2 MSIVs, concurrent failures of a feedwater line, the train B MSIV controls, and at least one additional steam system component such as one of the atmospheric steam dumps would be required before the postulated event would cause an uncontrolled cooldown. Therefore, the potential flooding of the junction box was considered to be a condition adverse to quality of more than minor, but not of major safety significance. The licensee intended to supplement the LER with the information relative to the additional concern raised by the inspectors.

For the licensee's original finding, as discussed in the LER, two opportunities were missed to identify the condition. One was during initial plant licensing and the second was during the analysis for a USAR Appendix I revision completed on August 13, 1996. However, even though USAR Appendix I lists the MSIVs as required equipment for a feedwater line break, the analysis did not state exactly why they were needed. Neither the high energy line break analysis nor the analysis for a loss of feedwater event discussed the need for isolation of the main steam lines. In addition, the plant was analyzed for certain steam breaks such as a stuck open steam generator relief valve without MSIV isolation.

The licensee was performing additional research and analysis on the effects of the feedwater line break. The results of that analysis were needed to determine the safety significance of the issue. The analysis was expected to be completed by about the end of May 1998. This issue is an Unresolved Item pending the inspectors' review of the analysis (50-282/98007-02(DRP); 50-306/98007-02(DRP)). In addition, the licensee was working on a major revision to USAR Appendix I and expected to complete that effort by about August 1998. The LER remains open pending completion of the long-term corrective actions (50-282/98005; 50-306/98005).

c. Conclusions

Licensee corrective actions for a self-identified condition adverse to quality were not thorough because licensee engineers failed to promptly identify or correct an equipment operability concern due to the potential for flooding of an adjacent room when they took corrective actions for potential flooding of the Unit 2 MSIV rooms.

O2.2 Investigation Into the Effects of Screenhouse Flooding on Safety-Related Fuel Oil Transfer Equipment

a. Inspection Scope (IP 71707)

The inspectors evaluated the effects of nonsafety-related pipe ruptures on safety-related systems located in the basement of the plant screenhouse. Normal and flood river level conditions were considered as well as the height of electrical switchgear mounted on the screenhouse basement walls. Included in the inspection was a review of the following documents:

- USAR Section 2.4.3.5, “Floods,” Revision 13;
- USAR Section 6.1.2.8, “Engineering Safety Features Protection from Internal Flooding,” Revision 14;
- USAR Appendix F, “Probable Maximum Flood Study,” Revision 4;
- NRC Generic Letter 88-20, “Individual Plant Examination [IPE] for Severe Accident Vulnerabilities - 10 CFR 50.54(f)”;
- Individual Plant Examination (IPE) NSPLMI - 9401, Table 3.3.9, Flood Designator SH2, “Effects of Flood Initiators,” Revision 0;
- Abnormal Procedure AB-4, “Flood,” Revision 12;
- Procedure 1C20.6 AOP1, “Loss of Power to MCC [motor control center] 1AB1," Attachment A, “Actions to Restore 12 Diesel-Driven Cooling Water Pump Day Tank Level,” Revision 4;
- Procedure 1C20.6 AOP2, “Loss of Power to MCC 1AB2," Attachment A, “Actions to Restore 22 Diesel-Driven Cooling Water Pump Day Tank Level,” Revision 5;
- Condition Report 19980645, “DDCLP [Diesel-Driven Cooling Water Pump] FO [Fuel Oil] Transfer Pumps Local Motor Starters Could Be Flooded in Screenhouse Basement at 674' if Pipe Break Exceeds Sump Pump,” issued March 31, 1998;
- Northern States Power Company Letter, “Information Related to Plant Drainage Systems Resolution of NRC Generic Issue No. 77,” dated January 3, 1985; and
- Drawing NF-39232, “Flow Diagram Unit 1 & 2 Fuel & Diesel Oil System,” Revision AC.

b. Observations and Findings

During a review of potential flooding consequences, the inspectors identified that the fuel oil transfer pump motor starter disconnect switches for the 12 and 22 DDCLPs could be flooded in the screenhouse basement if a raw water (cooling water, circulating water, or fire protection water) pipe break were to exceed the sump pump capacity. The situation could also exist, even if the associated system pumps were stopped, if the break was located below the intake canal water level. The disconnect switches were located at an elevation of 672.8 feet above sea level, while the normal water level in the intake canal was 674.5 feet.

A licensee letter to the NRC dated January 3, 1985, stated that no safety-related equipment was located in the basement of the screenhouse. Also, IPE Table 3.3.9 stated that a piping break in the lower level of the screenhouse would not affect the safeguards cooling water pumps and that all other remaining safeguards systems would function normally. The inspectors' finding contradicted those statements since flooding exceeding screenhouse sump removal capacity could submerge the DDCLP fuel oil transfer pump motor starter disconnect switches. Submerging the disconnect switches would prevent automatic transfer of fuel oil from the DDCLP fuel oil storage tanks to the DDCLP day tanks. The inspectors brought this finding to the attention of the licensee.

The licensee issued Condition Report 19980645 and concluded that the DDCLPs were still operable based on the ability to supply the DDCLP fuel oil day tanks from other safety-related, interconnected fuel oil storage tanks using the Unit 1 emergency diesel generator fuel oil transfer pumps. The inspectors verified that the appropriate procedures for using the alternate pumps were in place. The inspectors discussed the finding with a licensee risk assessment engineer who stated that the IPE would be revised during the next general revision to include the effects of flooding on the switches.

NRC Generic Letter 88-20 requested that the licensee submit an IPE. The licensee provided inaccurate information regarding the potential effects of internal flooding in the screenhouse basement in its IPE submittal dated March 1, 1994. However, the inaccuracy was not material in that systems and procedures were in place to compensate for the potential loss of the fuel oil transfer pumps due to flooding.

c. Conclusions

The licensee's IPE did not fully identify the effects of raw water line breaks in the screenhouse basement because the examination failed to recognize that flooding of the area could result in inoperability of the motor starter disconnect switches for the DDCLPs. The safety significance was mitigated by the ability to fill DDCLP day tanks from other safety-related, independent fuel oil supplies.

## O4 Operator Knowledge and Performance

### O4.1 Operator Knowledge Regarding Emergency Diesel Generator Auxiliaries

a. Inspection Scope (IP 61726)

The inspectors observed an outplant operator during performance of routine emergency diesel generator surveillance tests.

b. Observations and Findings

On April 13, 1998, the inspectors attended the pre-job brief and observed the performance of surveillance testing in accordance with SP 2093, "D5 Diesel Generator Slow Start Test," Revision 64, and SP 2334, "D5 Diesel Generator 24-Hour Load Test," Revision 7. Precaution and Limitation Section 3.8 of SP 2093 stated that the diesel generator was limited to 50-percent load with any one of the four duplex fuel oil filter cartridges out-of-service. After the operator had verified that all the precautions and limitations were met, the inspectors asked the operator to identify the fuel oil filters. The operator pointed to the lube oil filters located at the side of the diesel engine. The inspectors noted that these were the wrong filters and pointed out the error to the operator. The operator contacted the system engineer and learned that the duplex fuel oil filters were actually located under an auxiliary operating desk in the same diesel room. The operator then located and verified the correct lineup of the duplex fuel oil filters.

The operator had been verifying that all precautions and limitations were met as part of the normal routine for preparing for a surveillance test. Although it was a management expectation that the precautions and limitations were met, there was no requirement in SP 2093 to perform that verification, so the failure of the operator to verify the correct lineup of the fuel oil filters was not a procedure violation. However, since the operator had initially verified that the wrong filters were in service, this event indicated a knowledge deficiency on the part of the operator and, of more significance, a failure to use self-checking techniques.

c. Conclusions

An outplant operator had insufficient knowledge regarding the location of auxiliary equipment for the D5 emergency diesel generator and failed to use self-checking techniques when verifying that precautions and limitations for a surveillance test were met.

## II. Maintenance

### M1 Conduct of Maintenance

M1.1 Surveillance Testing and Maintenance Observations

a. Inspection Scope (IP 61726, 62707)

The inspectors witnessed all or major portions of the following maintenance and surveillance testing activities. Included in the inspection was a review of the surveillance procedures (SPs) and work orders (WOs) listed below as well as the appropriate USAR sections regarding the activities. The inspectors verified that the surveillance tests reviewed met the requirements of the Technical Specifications.

- WO 9713239, “PM 3001-2-D2, D2 Generator 18 Month Inspection,” Revision 13;
- WO 9713349, “Install Fusing for Indicating Lights on 11 Service Building Ventilation System Exhaust Fan Damper,” (Design Change Procedure);
- WO 9713351, “Install Fusing for Indicating Lights on 22 Service Building Ventilation System Exhaust Fan Damper,” (Post-Installation Test);
- WO 980377, “Replace Volume Control Tank Level Transmitter PT 141”;
- SP 1024, “Refueling Water Storage Tank Level Functional Test,” Revision 10;
- SP 1088, “Safety Injections Pump Test,” Revision 40;
- SP 1093, “D1 Diesel Generator Functional Test,” Revision 67;
- SP 1713, “Safety Injection Pump Mini Recirc Line Flowmeter Annual Functional Test,” Revision 5;
- SP 2093, “D5 Diesel Generator Slow Start Test,” Revision 64; and
- SP 2334, “D5 Diesel Generator 24 Hour Load Test,” Revision 7.

b. Observations and Findings

Maintenance and surveillance activities observed were all conducted well except for one minor problem with operator performance during testing in accordance with SP 2093, which was discussed in Section O4.1 of this report. Pre-job briefings were adequate for the work being performed. Communications between the individuals performing the work in the field and the control room were formal and proper. Appropriate safety precautions were followed for all the jobs. Noteworthy comments on specific jobs are discussed below.

- For WO 9713349 on the design change to install fusing for indicating lights, a licensee quality services inspector noticed that the electrician had inadvertently placed the wrong label on the newly installed fuse block. The electrician had labels for design changes for four different dampers with him, and accidentally installed the wrong one. The discrepancy was corrected on the spot and the quality services inspector initiated an employee observation report to document the error. The electrician failed to perform adequate self-checking to identify his own error. However, the inspectors noted that the electrician had deliberately and carefully checked all of the other steps of the work.
- The inspectors noted a minor procedural weakness during SP 1713 on the safety injection system. The I&C calibration worksheet attached to SP 1713 contained a note in the comments section to notify the I&C coordinator if tolerances could not be met. However, SP 1713 provided no guidance as to the quantitative value of the tolerances that were acceptable. The inspectors asked the I&C technician what the tolerances were. The technician said that the surveillance procedure contained instructions for checking the digital setpoints originally programmed

onto a microprocessor calibration card in the flowmeter instrument. Since the programmed setpoints were digital and not expected to change or drift, the tolerance between the desired output and the as-found values was zero. Although the information on acceptable tolerances was within the knowledge of that particular technician, SP 1713 should have clearly stated that the tolerance for values recorded on the I&C calibration worksheet was zero.

c. Conclusions

All of the ten maintenance and surveillance test activities observed were performed well with only two minor self-checking errors noted. One was identified by a licensee quality services inspector and the other by the NRC inspectors. Safe work practices and proper procedure use and adherence were also noted. Communications between the workers in the field and the control room were good. One minor procedure weakness was identified in that a surveillance test procedure did not contain tolerances for test data.

## M2 Maintenance and Material Condition of Facilities and Equipment

### M2.1 Examination of Backup Air Accumulator Functions, Surveillance Testing, Material Condition, and Configuration Control

a. Inspection Scope (IPs 61700, 62707)

The inspectors reviewed design basis information, material condition, configuration control, and surveillance test procedures associated with safety-related and nonsafety-related backup air accumulators in Units 1 and 2. The review included backup air accumulator functional, performance, and design requirements as well as generic letter responses and actions. Particular attention was paid to interfaces between safety-related and nonsafety-related portions of the backup air accumulators and air supply lines. Included in the inspection was a review of the following documents:

- Design Basis Document (DBD), Section 5.6, “Backup Accumulators,” Revision 3;
- USAR Section 10.3.10, “Station Air System,” Revision 14;
- USAR Section 14.5.4, “Steam Generator Tube Rupture,” Revision 14;
- Prairie Island Nuclear Generating Plant Response to Generic Letter 88-14 “Instrument Air Supply Problems Affecting Safety-Related Equipment,” dated February 20, 1989;
- Procedure C34 AOP1, “Loss of Instrument Air,” Revision 8;
- SP 1298, “Pressurizer PORV [Power Operated Relief Valve] Air Accumulator Check Valve Leak Test,” Revision 4;
- SP 2298, “Pressurizer PORV Air Accumulator Check Valve Leak Test,” Revision 3;
- Test Procedure (TP) 1766, “Instrument Air to Vacuum Breaker Check Valve Test,” Revision 3;
- TP 2766, “Instrument Air to Vacuum Breaker Check Valve Test,” Revision 6;
- Preventative Maintenance Procedure (PM) 3505-5, “Instrument Air System Dew Point Test,” Revision 7;

- Drawing NF-39770, “Instrument Air Supply and Control Piping Reactor Building - Unit 1,” Revision R;
- Drawing NF-39771-1, “Instrument Air Supply and Control Piping Auxiliary Building - Unit 1 & 2,” Revision T;
- Drawing NF-39771-2, “Instrument Air Supply and Control Piping Auxiliary Building - Unit 1 & 2,” Revision P;
- Drawing NF-39771-3, “Instrument Air Supply and Control Piping Auxiliary Building - Unit 1 & 2,” Revision M;
- Drawing NF-39772-1, “Instrument Air Supply and Control Piping Turbine Building - Unit 1,” Revision W;
- Drawing NF-39773, “Instrument Air Supply and Control Piping Reactor Building - Unit 2,” Revision M;
- Drawing NF-39774-1, “Instrument Air Supply and Control Piping Turbine Building - Unit 2 and Screenhouse Units 1 & 2,” Revision T;
- Drawing NL-39776-600, “Instrument Air Accumulator,” Revision Q;
- Drawing NH-92966, “Accumulator and Solenoid Mounting Valve Details for Turbine Driven Auxiliary Feedwater Pump Steam Supply Valve,” Revision D;
- Drawing NL-39776-811-1, “Supply & Control Air Piping for Accumulators & Control Valves,” Revision V;
- Drawing X-HIAW-1106-1, “6"-N-376-SP Swing Check Valve,” Revision 1; and
- Drawing X-HIAW-1195-14, “General Arrangement Model 2FII-18" Butterfly Valve with Bettis Operator,” Revision A.

b. Observations and Findings

The inspectors found that 28 backup air accumulators were installed for air-operated valves in Units 1 and 2. Of the 28 backup air accumulators, only four were safety-related: those for the containment vacuum breakers and pressurizer PORVs. The inspectors reviewed TP 1766 and TP 2766 for the containment vacuum breakers and SP 1298 and SP 2298 for the safety-related pressurizer PORV accumulators and determined that the licensee properly tested each accumulator and associated inlet check valve.

The inspectors identified two minor equipment database discrepancies. First, the inspectors noted that for nine of the nonsafety-related backup air accumulators, the licensee’s computerized equipment database listed the inlet air supply check valve manufacturer as “Dragon.” Inspection of the as-built configuration of the accumulators showed that these check valves were actually “Powell” manufactured valves. Second,

the computer database cited drawing X-HIAW-1106-1 to describe the inlet air supply check valve to six nonsafety-related backup air accumulators on Unit 2. Drawing X-HIAW-1106-1, however, referred to a 6-inch nominal diameter swing check valve when the actual size of the inlet check valves on the accumulators was ½-inch nominal diameter. The errors were referred to the system engineer for resolution.

During a review of the DBD information, the inspectors asked the system engineer to identify exactly which backup air accumulators were considered safety-related, since the drawings and information were somewhat confusing. While responding to the inspectors' question, the system engineer discovered that the design requirement information for the safety-related containment vacuum breaker accumulators discussed in DBD Section 5.6.1.A.3 was incorrect. The DBD referenced drawing NL-39776-600 for the containment vacuum breaker safety-related accumulators. The actual safety-related air accumulators supplying the containment vacuum breakers were described in Drawing X-HIAW-1195-14. Drawing NL-39776-600 described nonsafety-related accumulators also installed in the system. The inspectors discussed the findings with the DBD administrator who stated that a change notice would be issued to correct Section 5.6 in the next DBD revision.

The inspectors examined the licensee response and subsequent actions related to Generic Letter 88-14 and found that licensee commitments and actions had been properly implemented in surveillance test and plant procedures. The inspectors specifically verified that the actions to sample air system quality semi-annually and add procedural guidance concerning the failure modes of valves equipped with backup air accumulators had been completed.

Material condition of the backup air accumulators and associated air supply lines was good. All equipment was properly maintained with no signs of degradation. The inspectors found that all of the backup air accumulators met the design, functional, and performance requirements discussed in the USAR and other design basis documentation.

c. Conclusions

Safety-related and nonsafety-related backup air accumulators for air-operated valves in Unit 1 and Unit 2 were maintained well and met design, functional, and performance requirements. One minor error was noted in the DBD describing the safety-related backup air accumulators for the containment vacuum breaker valves. Two more minor discrepancies were noted in the configuration documentation contained in a computerized database for the nonsafety-related portions of the backup air accumulator system.

## M3 Maintenance Procedures and Documentation

M3.1 Procedure Deficiencies Resulting in the Inadvertent Rolling of the D2 Emergency Diesel Generator (EDG)

a. Inspection Scope (IPs 61700, 62707)

The inspectors examined the circumstances of the inadvertent rolling of the D2 EDG during performance of 18-month preventive maintenance. Work orders, isolation and restoration records, surveillance procedure revision records, and maintenance schedules associated with the D2 preventive maintenance were reviewed. The inspectors interviewed maintenance and electrical engineering supervisors to understand the communications, root causes, and corrective actions associated with the maintenance activity. Included in the inspection was a review of the following documents:

- WO 9713241, "PE 3001-4-D2, D2 Generator 18-Month Inspection - Electrical," Revision 1;
- WO 9713239, "PM 3001-2-D2, D2 Generator 18-Month Inspection," Revision 13;
- SP 1306, "D2 Diesel Generator Functional Test," Revision 2;
- SP 1306, "D2 Diesel Generator Functional Test," Revision 3; and
- Procedure Submittal Form, Tracking I.D. # PCR19962335, SP 1306, "D2 Diesel Generator Functional Test," dated August 19, 1997.

b. Observations and Findings

On April 30, 1998, during performance of work under WO 9713239, testing in accordance with SP 1306, Revision 3, was performed. When the D2 diesel generator control switch was placed in the neutral position per SP 1306, Step 7.8, the diesel air start solenoid valve opened and the EDG engine rolled. The engine did not start because the fuel oil supply to the EDG was isolated.

The inspectors noted that SP 1306, Revision 2, had contained a prerequisite that the D2 EDG be tagged out-of-service. However, Revision 3 to SP 1306 changed the prerequisite (Step 6.1) to require that the D2 EDG be logged out-of-service instead of tagged out-of-service. On April 30, 1998, mechanical maintenance on D2 EDG was still in progress while electrical maintenance had been completed. Electrical post-maintenance testing in accordance with SP 1306 was scheduled. Realizing a potential conflict between mechanical and electrical activities and tagouts, the electrical maintenance supervisor stated during the daily work planning meeting on April 30, 1998, that only the hold cards on the EDG output breaker and ground truck should be cleared prior to performing the testing. The remaining hold cards on the D2 diesel generator air starting isolation valve, 2DG-35, and other components were to remain in place until other mechanical maintenance had been completed.

The electrical maintenance supervisor communicated these tagout instructions to the Unit 1 day-shift shift supervisor and night-shift electrical lead-in-charge. Despite those instructions, the Unit 1 night-shift shift supervisor and electrical lead-in-charge cleared all of the hold cards associated with the D2 EDG electrical maintenance. This cleared the hold card on valve 2DG-35 providing a source of starting air to the diesel engine. When SP 1306, Step 7.8, was reached and the control switch was placed in the neutral

position, a start signal was received, energizing the air start solenoid valve, sending starting air to the engine, and causing the EDG to roll.

A system engineer locally observing the testing noticed the condition and manually isolated starting air to stop the diesel rolling. Knowing that the D2 EDG had been rolled without prelubrication, the EDG vendor representative later removed inspection covers and observed normal prelubrication oil flow before the engine was run again. The licensee concluded that no damage to EDG bearings or components had occurred.

Testing was aborted and engineers revised the surveillance procedure to include the correct isolations. Maintenance supervisors reviewed the revised surveillance procedure and verified that the necessary isolations were in place to prevent the D2 EDG from rolling again. The revised SP 1306 was then used to perform the testing without discrepancy. The licensee assigned its Error Reduction Task Force to conduct an investigation of the event and recommend corrective action. That investigation was not complete at the conclusion of this inspection period but some corrective actions had already been taken. Electrical engineering personnel were reviewing three other 18-month EDG surveillance procedures (SP 1150, SP 2150, and SP 2306) to clearly identify mechanical and electrical interfaces and to ensure that adequate isolations existed prior to starting work.

Criterion V of Appendix B of 10 CFR Part 50 requires, in part, that activities affecting quality be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances. Surveillance Procedure 1306, Revision 3, was not appropriate to the circumstances because prerequisites and initial conditions Step 6.1 did not contain adequate isolation instructions to prevent an inadvertent start attempt of the diesel engine during surveillance testing. This was a violation (50-282/98007-03(DRP)).

Although the violation was considered of minor safety significance for the health and safety of the public, the inadvertent rolling of the EDG could have resulted in personnel injury to maintenance workers. In addition, one of the root causes of the violation was that the licensee's review of logic circuits was inadequate to understand the effects of the surveillance activity. Since several other errors associated with inadequate logic reviews have been documented in recent inspection reports, the licensee-identified violation is considered repetitive and therefore enforcement discretion was not considered appropriate.

c. Conclusions

A procedural deficiency and poor communications between electrical maintenance supervisors and operations personnel contributed to the inadvertent rolling of the D2 EDG during electrical post-maintenance testing. Specifically, SP 1306 did not provide instructions for ensuring that mechanical portions of the EDG system were properly isolated.

M3.2 Potential Failure to Verify Bypassing of Trips on Emergency Diesel Generators

a. Inspection Scope (92902)

During the licensee's detailed review of SP 1306 as a result of the event discussed in Section M3.1 of this report, engineers discovered that they may have neglected to test one specific EDG trip feature required by Technical Specifications (TSs). The inspectors reviewed the details of the finding and the licensee's subsequent actions. The following documents were reviewed:

- SP 1093, "D1 Diesel Generator Functional Test," Revision 67;
- SP 1306, "D2 Diesel Generator Functional Test," Revision 3;
- Drawing NE-40006, Sheet 73, "Schematic Diagram," Revision YB;
- Drawing NE-40009, Sheet 82, "D2 Emergency Diesel Generator Schematic Diagram," Revision CW;
- USAR Section 8.4, "Plant Standby Diesel Generator Systems," Revision 14; and
- USAR Section 8.8, "Inspection and Testing," Revision 11.

b. Observations and Findings

Technical Specification (TS) 4.6.A.3.e required that at least every 18-months, for Unit 1, the licensee simulate a safety injection signal and verify automatic bypass of the diesel generator trips, except those for engine overspeed, ground fault, and generator differential current. The performance of testing in accordance with SP 1093 and SP 1306, for the D1 and D2 EDGs respectively, met the TS requirement for testing the automatic blocking of the low lube oil pressure, high jacket coolant temperature, and high crankcase pressure trips. However, on April 30, 1998, the licensee discovered that the automatic bypassing of the reverse current trip was not being tested.

At the time of discovery, the D2 EDG was inoperable for normal preventive maintenance and SP 1306 was revised to include testing of the automatic bypass feature of the reverse current trip before the EDG was returned to an operable status. The bypassing feature worked as designed during the test. The licensee made an initial operability assessment that the D1 EDG was operable because engineers thought that the verification had been accomplished by some other surveillance test. The superintendent of electrical systems engineering, who made the operability decision, stated that it was based on the fact that diesel tripping logic had been examined in detail at least three times in the recent past. One time was during completion of an Operational Event Assessment from an event at another plant, one time was in preparation for and during the NRC's Electrical Distribution System Functional Inspection, and one time was during the licensee's reviews required by NRC Generic Letter 96-01, "Testing of Safety-Related Logic Circuits."

No existing surveillance test which performed the required circuit verification was found in the next few days, so SP 1093 was revised and testing was performed on May 7, 1998. The bypassing feature worked as designed. At that time, licensee engineers still believed that the trip bypass feature had been properly tested in the past, but performed

the new test anyway as a conservative action. The D5 and D6 EDGs on Unit 2 were of a different design and had been properly tested.

Technical Specifications require that the bypassing of that trip be verified at least each 18-months. The licensee had not found proof that the verification had ever been accomplished before April 30 and May 7, 1998. The licensee questioned if the TSs and regulatory guidance specifically requires verification of the bypassing of the reverse current trip. The inspector will further review this issue and discuss the technical requirements with the Division of Reactor Safety technical staff. The issue is considered an Unresolved Item until the inspectors have completed this review and determined if a violation of TSs had occurred (50-282/98007-04(DRP)).

c. Conclusions

The verification required by TSs at least each 18-months that the reverse current trip of the EDGs was automatically bypassed during a safety injection may not have been accomplished for the D1 and D2 EDGs until April 30, and May 7, 1998. If this is a valid concern, the licensee missed at least three opportunities in the last few years to identify the discrepancy.

M3.3 Procedure Deficiencies Resulting in the Backwards Installation of Auxiliary Feedwater (AFW) Pump Orifices

a. Inspection Scope (IP 37551)

The inspectors examined the circumstances surrounding the backwards installation of Unit 2 AFW flow orifices. Work orders, surveillance procedures, condition reports, and engineering drawings associated with the Unit 2 AFW to steam generator flow orifice installations were reviewed. Maintenance personnel involved with the removal and installation of the orifices were interviewed to understand the materials and information available to workers at the job site. Included in the inspection was a review of the following documents:

- WO 9800533, “Inspect FE [Flow Element]-27146, AFW to 21 SG [Steam Generator] Flow Orifice”;
- WO 9800534, “Inspect FE-27148, AFW to 22 SG Flow Orifice”;
- USAR Section 11.9.2.2, “Auxiliary Feedwater System,” Revision 14;
- SP 2101, “21 Motor-Driven Auxiliary Feedwater Pump Once Every Refueling Shutdown,” Revision 26;
- SP 2103, “22 Turbine-Driven Auxiliary Feedwater Pump Once Every Refueling Shutdown,” Revision 29;
- Condition Report 19980890, “Unit 2 Degraded AFW Flow Indication as a Result of Orifices Being Installed Backwards,” identified April 27, 1998;

- Condition Report 19980891, "22 AFW Pump Declared Inoperable Due to Surveillance Results That Would Not Have Met Operability Limits," identified April 27, 1998; and

- Drawing X-HIAW-452-2, "Daniel Industries Inc. Orifice Flange Plate Drawing," Daniel Industries Drawing SO-23107-2.

b. Observations and Findings

On April 26, 1998, an engineering superintendent performing a close-out review of a SP 2103 procedure change request that included changing acceptance criteria, noted that this change should have been completed prior to a March 5, 1998, performance of the same surveillance test. The superintendent's finding prompted an analysis of the March 5 data which suggested that the revised acceptance criteria would not have been met. Subsequently, the licensee determined that the AFW to steam generator orifice plates for 21 and 22 steam generators (FE-27146 and FE-27148), which had been removed for inspection during a Unit 2 forced outage in February-March 1998, had been installed backwards.

The orifice plate manufacturer was contacted and indicated that a reversed flow orifice would result in a flow indication approximately 20-percent lower than actual. Testing in accordance with SP 2103 and SP 2101 had been performed on March 4 and 5, 1998, to meet American Society of Mechanical Engineers (ASME), Section XI, check valve testing requirements imposed during extended shutdowns. Licensee engineers determined that the Unit 2 AFW pumps were operable based on the following:

- the flow error caused by the orifice plates being installed backwards was conservative, in that actual flow was greater than indicated flow;

- the previous performance of testing in accordance with SP 2101 and 2103, with the orifice plates in the proper orientation, had been satisfactory when compared to the revised test acceptance criteria;

- no maintenance had been performed on the Unit 2 AFW pumps; and

- the monthly AFW pump surveillances did not suggest any pump degradation.

The inspectors reviewed WOs 9800533 and 9800534 which contained instructions for removal, inspection, and reinstallation of the AFW to steam generator flow orifices. The work orders had been written by the Unit 2 AFW system engineer and the work had been accomplished on February 9 and 10, 1998. Work Order Step 7.8 provided instructions to reinstall the orifice plates in the AFW piping following inspection but did not provide any guidance as to the orientation of the plates. While a drawing showing the proper orifice orientation was attached to the WOs, Step 7.8 did not specifically refer the workers to that information.

On April 29, 1998, the inspectors interviewed the maintenance workers who reinstalled the orifice plates in accordance with Step 7.8. None of the workers could recall if they had referred to the drawing showing the correct orifice orientation or if the drawing had

even been attached to the WOs used at the job site on February 9 and 10, 1998. One of the workers mentioned that, since this work took place in the radiologically clean portion of the auxiliary building, it was likely that the record copy of the WO was present at the job site. Although the inspectors could not independently verify the statement, the same worker said that it was likely that the record copy would have had the drawing showing the correct orifice orientation attached. During the investigation, the inspectors noted that the orifice plates had the word "Inlet" stamped on the side of the orifice through which flow should have entered. The maintenance workers did not notice or fully consider the implications of that stamp.

Criterion V, of Appendix B, of 10 CFR Part 50, requires, in part, that activities affecting quality be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances. Step 7.8 of WOs 9800533 and 9800534 was not appropriate to the circumstances because it did not contain adequate instructions to ensure the proper orientation of flow element orifice plates when reinstalled in the AFW system. As a result, maintenance workers reinstalled the orifice plates backwards, resulting in low AFW system flow indications during surveillance testing. This was a violation (50-306/98007-05(DRP)).

Installing the orifice plates backwards affected AFW flow measurements but did not affect actual flow to the steam generators. Since the flow indications were lower than actual flow, the error was in the conservative direction for most accident conditions since emergency operating procedures (EOPs) call for maximum AFW flow until steam generator levels are in the indicating band and then call for controlling AFW flow by observing steam generator levels rather than AFW flow. However, if AFW flow indicated less that 200 gallons per minute when it was actually greater than 200 gallons per minute, an unnecessary entry into Functional Response Procedure 1(2)FR-H.1, "Response to Loss of Secondary Heat Sink," could have resulted during certain scenarios. Thus the error was considered to be of more than minor safety significance.

The licensee has referred this event to the Error Reduction Task Force for determination of root cause and recommendations to prevent reoccurrence. As an interim corrective action, SP 2101 and SP 2103 were quarantined until the procedure change process was completed. Due to previously identified WO problems, the licensee had instituted a user review of all safety-related WOs before they were used. However, the AFW orifice WOs had been written before that policy was established. New WOs 9804014 and 9804016 have been written to direct the reorientation of the orifice plates during the next scheduled refueling outage in November 1998. Because a number of examples of inadequate WOs have been identified in recent NRC inspections, this event was considered repetitive and enforcement discretion was therefore not appropriate.

c. Conclusions

Lack of clear direction to maintenance personnel reinstalling AFW flow orifices in accordance with WOs 9800533 and 9800534 led to the orifices being installed backwards. The work order step for orifice reassembly did not provide instructions or refer to the drawing containing the proper orientation of the orifice plates in the AFW line. Maintenance personnel also demonstrated the lack of a questioning attitude concerning proper orifice orientation by either not noticing or fully considering the

implications of the word “Inlet” stamped on the orifice face and not referring to drawings describing correct system configurations.

M3.4 Failure to Promptly Correct Inadequate Acceptance Criteria in AFW Surveillance Test Procedures

a. Inspection Scope (IP 37551)

During the course of its investigation of the event discussed in Section M3.3 of this report, the licensee discovered that it had failed to promptly complete some corrective actions for a previously identified violation. The inspectors reviewed the circumstances of the finding. The inspectors reviewed the following documents as part of the inspection:

- SP 2101, “21 Motor-Driven Auxiliary Feedwater Pump Once every Refueling Shutdown,” Revision 26;
- SP 2103, “22 Turbine-Driven Auxiliary Feedwater Pump Once every Refueling Shutdown,” Revision 29; and
- Condition Report (CR) 19980891, “22 AFW Pump Declared Inoperable Due to Surveillance Results That Would Not Have Met Operability Limits,” identified April 27, 1998.

b. Observations and Findings

In May 1997, the NRC identified that AFW surveillance procedures, as written, did not verify that the AFW pumps could meet their design flow requirements because they did not adequately consider the effects of instrument tolerances. The finding was documented in Safety System Operational Performance Inspection Report 50-282/97008(DRS); 50-306/97008(DRS), Section E1.1, and the associated enforcement action documentation (EA 97-290). Based on engineering calculation ENG-ME-321, the licensee subsequently determined new acceptance criteria and initiated action item CR 19970254 to change the acceptance criteria for each of the eight affected surveillance procedures. Procedure change requests (PCRs) were issued for all eight of the procedures and temporary memoranda were issued for six of the eight procedures pending completion of the procedure change process. Because the next Unit 2 refueling outage was not scheduled until November 1998, it was not expected that the Unit 2 AFW refueling surveillance procedures (SP 2101 and SP 2103) would be needed prior to the completion of the procedure change process. As a result, temporary memoranda were not issued for SP 2101 or SP 2103. However, SP 2101 and SP 2103 were not quarantined to prevent their use until the procedure revisions were completed.

During the course of the Unit 2 outage for the removal of the part length control rod drive mechanisms, the licensee determined that, upon returning to power, SP 2101 and SP 2103 would be required to meet ASME Section XI check valve testing requirements imposed during extended cold shutdown periods. Testing in accordance with SP 2103 was performed on March 4, and SP 2101 on March 5, 1998, prior to the PCR for these surveillances being completed. Failure to revise the procedures before they were used

was of more than minor safety significance because, had they been revised, it is likely that the improperly installed orifice plates discussed in Section M3.3 of this report would have been discovered because the surveillances would have failed to meet the revised acceptance criteria. As part of the corrective actions for this issue, the licensee was developing administrative guidance for establishing quarantine provisions for procedures that should not be used until a revision is completed.

Failure to promptly correct the inappropriate acceptance criteria in AFW surveillances SP 2101 and SP 2103, or to take actions to assure that the procedures would not be used until corrected, was a violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action" (50-306/98007-06(DRP)).

c. Conclusions

Failure to update AFW refueling surveillances with revised acceptance criteria resulted in performance of two surveillance tests with the wrong acceptance criteria. It also resulted in a missed opportunity to identify improperly installed flow orifice plates in the AFW system. A weakness in the licensee's administrative control program was also revealed in that there was no guidance for placing procedures in quarantine until necessary procedure revisions were completed.

## III. Engineering

### E2 Engineering Support of Facilities and Equipment

E2.1 Engineering Support of Operations, Maintenance, and Surveillance Testing Activities

Several of the issues discussed in previous sections of this report involved equipment operability issues or maintenance and surveillance testing activities. However, most of the issues also involved engineering support of those activities and several deficiencies in that support were identified. Some of the issues were identified by the plant staff, but others were identified by the NRC. During this inspection period, violations of regulatory requirements were identified concerning two instances of failure to promptly correct conditions adverse to quality, two instances of procedures that did not contain enough information to ensure successful performance of maintenance and testing activities, and one instance of failure to develop testing for a safety-related system that was installed over 2 ½ years ago. In addition, weaknesses were identified in the plant's Individual Plant Examination submittal, the plant's computerized equipment database, and a safety evaluation for a temporary modification. Two other licensee-identified issues were considered unresolved items which meant that violations of regulatory requirements may have occurred but more information was needed for a final determination. Taken together, the findings raise a concern on the part of the NRC regarding the quality of engineering support at the facility.

E2.2 Review of Updated Safety Analysis Report (USAR) Commitments (IPs 37551, 92903)

While performing the inspections discussed in this report, the inspectors reviewed the applicable portions of the USAR that related to the areas inspected and used the USAR

as an engineering/technical support basis document. The inspectors compared plant practices, procedures, and/or parameters to the USAR descriptions as discussed in each section. The inspectors verified that the USAR wording was consistent with the observed plant practices, procedures, and parameters. No discrepancies were identified.

## E3 Engineering Procedures and Documentation

### E3.1 Inadequate Temporary Modification on Air Supply to Cooling Water Strainers

a. Inspection Scope (IP 92903)

The inspectors reviewed the adequacy of a temporary modification performed in 1995 to add a safety-related backup instrument air supply for operation of the cooling water strainer backwash valves. As part of this inspection, the inspectors reviewed the following documents:

- Temporary Modification 95T047, "Backup Compressed Air Supply for Cooling Water Strainer Backwash Valve Actuator," Revision 0;
- WO 9606278, "Install Backup Compressed Air System for Cooling Water Strainer Backwash Control Valves";
- NRC Information Notice No. 88-24, "Failures of Air-Operated Valves Affecting Safety-Related Systems";
- Automatic Switch Company (ASCO) Catalog No. 31, "ASCO Red-Hat Solenoid Valves," Bulletin 8317;
- Neles-Jamesbury Valves Catalog, Bulletin 251;
- Procedure H10.1, "ASME Section XI Inservice Testing Implementation Program," Revision 8; and
- Design Change 97ZH02, "Backup Compressed Air Supply for the Control Room Chillers," Revision 1.

b. Observations and Findings

The safety-related cooling water system was designed with four strainers that automatically backwashed by flushing water back into the intake bay on high strainer differential pressure. The strainer backwash control valves were designed to fail to the open position on loss of instrument air to insure that the strainers could still be flushed during a loss of the nonsafety-related instrument air system. During a self-assessment of the cooling water system in 1995, licensee engineers discovered that, if all four of the backwash valves were to fail open, enough flow might be diverted from the cooling water header that the design heat removal capability might not be met. To address that concern, the engineers developed a temporary modification to install a safety-related backup supply of compressed air so that in case of loss of instrument air, the control

valves would not fail open. The backup air would also allow the backwash valves to be used to clean the strainers as needed during a loss of instrument air event. Installation of the backup system was completed in September 1995. Preoperational testing of the system was completed on October 3, 1995.

The inspectors had three concerns with the temporary modification:

- The installation was intended to be temporary. The safety evaluation for the temporary modification stated, “In the long term, a modification will be initiated.” After about 2 ½ years, the temporary installation was still in place and action to design a permanent replacement was proceeding slowly.

- The compressed air bottle installed was normally charged to about 2200 pounds per square inch-gauge. The safety evaluation for the installation addressed the possibility of the regulator on the compressed air bottle failing and subjecting the system to the full bottle pressure. In that case, the installation tubing would probably fail, resulting in the same mode of failure as the original loss of instrument air pressure that the installation was intended to prevent. The licensee concluded that no new type of malfunction of equipment important to safety was introduced.

  However, the regulator was exactly the same (Smith Model H1408-346) as in another recently installed backup air system for the control room chillers. The safety evaluation for that design change stated that the regulator was a two-stage model. In case of failure of the first stage, an internal relief valve prevented damage to the second stage. In case of failure of the second stage, discharge pressure of the regulator would be about 250-pounds per square inch-gauge. That pressure would probably not damage the installation tubing but, according to the appropriate vendor catalogs, would overpressurize the solenoid and control valves in the backwash system. Such a condition could potentially prevent the backwash valves from opening when required as discussed in NRC Information Notice No. 88-24. The inspectors determined that the safety evaluation for the temporary modification did not address that type of failure, nor verify that the modification did not introduce a different type of malfunction of equipment important to safety than those previously evaluated in the USAR.

  At the end of the inspection period, the system engineer informed the inspectors that he was in the process of revising the safety evaluation to include failure of the regulator second stage. This issue will be considered an Unresolved Item (50-282/98007-07(DRP); 50-306/98007-07(DRP)) pending revision of the safety evaluation to determined whether a 10 CFR 50.59 violation may have occurred due to failure to evaluate the regulator second stage failure.

- The inspectors identified that no testing or preventive maintenance procedures were developed to test or inspect the installation despite the fact that the system had been in place for over 2 ½ years. Proper operation of most of the system was verified once on installation, but the operation of the check valves intended to isolate the safety-related backup air supply from the nonsafety-related instrument air system in case of its failure were not tested on installation or since.

For the similar design change that installed a backup air supply to the control room chillers, the licensee developed preventative maintenance procedures that checked all components annually. Failure to establish tests to demonstrate that the components and system installed under Temporary Modification 95T047 would perform satisfactorily in service was a violation of 10 CFR Part 50, Appendix B, Criteria XI, "Test Control" (50-282/98007-08(DRP); 50-306/98007-08(DRP)).

c. Conclusions

The safety evaluation for Temporary Modification 95T047, which added a safety-related backup instrument air supply for operation of the cooling water strainer backwash valves, was not adequate in that it did not address the effects of a failure of the second stage of the compressed air bottle regulator. In addition, although the temporary modification had been in place for over two and one half years, it had not been replaced by a permanent modification nor had periodic test or inspection procedures been developed to verify its proper operation.

## E8 Miscellaneous Engineering Issues (IPs 97700, 92903)

E8.1 (Open) LER 50-282/98006; 50-306/98006 (1-98-06): Control Room Vent Outside Air Equipment Qualification.

This LER discussed a condition, identified by the licensee, in which one of the outside air isolation dampers for the control room ventilation system was found not to be qualified for the environment which might exist during a design basis accident. At the time of discovery, the issue was not an operability concern since the control room outside air dampers were all isolated for other reasons. However, the condition had existed since initial plant construction.

As discussed in the LER, the damper was backed by redundant downstream isolation dampers, but the configuration would not have met single failure criteria assuming the subject damper failed due to a harsh environment. Since all control room outside air dampers were isolated at the time of discovery, no additional immediate corrective actions were necessary. The licensee's long-term corrective actions, as described in the LER, should be adequate to resolve the condition. No other recent cases of inadequate environmental qualification of equipment have been identified and the finding appeared to be an isolated case. All other control room ventilation equipment, including the other outside air isolation dampers, were located in areas that would be mild environments during design basis accidents.

Failure of the licensee to assure that suitable materials, parts, and equipment were selected for damper CD-34177 so that it could perform its safety-related function of isolating outside air to the control room during all design basis accidents was a violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control." This non-repetitive,

licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the NRC Enforcement Policy (50-282/98007-08(DRP); 50-306/98007-08(DRP)). The LER will remain open pending the completion of the corrective actions discussed therein.

## IV. Plant Support

### R3 Radiological Protection and Chemistry Procedures and Documentation

R3.1 Condenser Air Ejector Gas Monitor Review

a. Inspection Scope (IP 71750)

The inspectors examined the material condition and the design, performance, and surveillance requirements associated with the Unit 1 and 2 condenser air ejector gas monitors. Interactions with connected auxiliary building ventilation systems were reviewed as well as radioactive source term bases. Included in the inspection was a review of the following documents:

- Final Safety Analysis Report (FSAR), Section 11.2.3, “Condenser Air Ejector Gas Monitor,” Amendment 12;
- USAR Section 7.5.2, “Process Radiation Monitoring System,” Revision 14;
- USAR Section 14.5.4, “Steam Generator Tube Rupture,” Revision 14;
- USAR Appendix D, “Radioactive Source Bases,” Revision 14;
- Offsite Dose Calculation Manual, Section 5.0, “Gaseous Effluent Calculations,” Revision 14;
- Radiation Protection Implementing Procedure (RPIP) 1732, “Radioactive Source Tracking, Inventory and Leakage Testing,” Revision 0;
- SP 1028, “Radiation Monitoring Monthly Source Test,” Revision 32;
- Radiation Protection Procedure (RP) 122, “Semi-Annual Leakage Test Source Leak Test”;
- Prairie Island Nuclear Generating Plant Annual Inventory Source Location List; and
- Prairie Island Nuclear Generating Plant Annual Inventory Source List Annual Decay.

b. Observations and Findings

The inspectors examined the material condition and routing of ducting connecting the Unit 1 and 2 condenser air ejector discharges to the auxiliary building ventilation systems. Sufficient holdup volume between the air ejector discharges and the auxiliary building ventilation systems was available for the decay of short-lived isotopes that would be discharged from the condensers during a steam generator tube rupture accident. The material condition of the air ejector gas monitors and connected ducting was good. Radioactive source term quantities, activities, and assumptions were consistent between offsite dose calculation manual and USAR references.

The inspectors researched the condenser air ejector radiation monitor check source inventory requirements and found that, when performing testing in accordance with SP 1028, Steps 7.8 and 7.9, the technicians used the installed check sources to obtain a meter response on the air ejector gas monitors (1R-15 and 2R-15). Radiation Protection Implementing Procedure 1732, Step 11.0, stated that since SP 1028 used the sources to obtain 1R-15 and 2R-15 monitor responses, the sources were effectively inventoried in place and no further verification was required.

The air ejector radiation monitor check sources (Serial Number 02-013 for Unit 1 and Serial Number 02-016 for Unit 2) both contained 9 microcuries of Cesium-137. Since the activities were less than 10 microcuries, the check sources were exempt according to 10 CFR 30.71, Schedule B. Thus, there was no requirement mandating inventory or leakage testing of the air ejector radiation monitor check sources. The inspectors noted that the check sources were not included in the annual source inventory location or decay lists maintained by the radiation protection department. However, the lists contained several other exempt sources that were less than the limits of 10 CFR 30.71, Schedule B. The inspectors asked a radiation protection department system engineer why the air ejector radiation monitor check sources had not been included in the inventory lists of sources maintained by the licensee. The system engineer responded that this was an oversight and that it was intended that the check sources should have been included in the inventory lists. The system engineer subsequently updated the annual inventory lists to include the sources.

c. Conclusions

The air ejector radiation monitor check sources were not included in the annual radioactive source inventory lists. Even though the sources contained exempt quantities of Cesium-137, the radiation protection department had made a common practice of including all sources on the annual inventory lists for control and tracking purposes.

## V. Management Meetings

### X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on May 11, 1998. The licensee acknowledged the findings presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

J. Sorensen, Plant Manager
K. Albrecht, General Superintendent Engineering, Electrical/Instrumentation & Controls
T. Amundson, General Superintendent Engineering, Mechanical
J. Goldsmith, General Superintendent Engineering, Generation Services
J. Hill, Manager Quality Services
G. Lenertz, General Superintendent Plant Maintenance
R. Lindsey, General Superintendent Safety Assessment
D. Schuelke, General Superintendent Radiation Protection and Chemistry
T. Silverberg, General Superintendent Plant Operations
M. Sleigh, Superintendent Security

INSPECTION PROCEDURES USED

| | |
|---|---|
| IP 37551: | Engineering |
| IP 61726: | Surveillance Observations |
| IP 62707: | Maintenance Observations |
| IP 71707: | Plant Operations |
| IP 71750 | Plant Support Activities |
| IP 92700: | Onsite Follow-up of Written Reports of Non-routine Events at Power Reactor Facilities |
| IP 92901: | Follow up - Operations |
| IP 92902: | Follow up - Maintenance |
| IP 92903: | Follow up - Engineering |

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

| | | |
|---|---|---|
| 50-306/98007-01(DRP) | VIO | Failure to Promptly Identify or Correct a Flooding Concern for a Unit 2 MSIV Junction Box |
| 50-282/98007-02(DRP)<br>50-306/98007-02(DRP) | URI | Potential Inoperability of MSIVs due to a Feedwater Line Break |
| 50-282/98005 (1-98-05)<br>50-306/98005 | LER | Inoperability of Actuation Logic for Main Steam Isolation Valves in Certain Flooding Conditions from a Feedwater Line Break |
| 50-282/98007-03(DRP) | VIO | Inadequate Procedure for Electrical Testing of the D2 EDG |
| 50-282/98007-04(DRP) | URI | Possible Failure to Perform TS Required Surveillance Testing of the Unit 1 EDGs |
| 50-306/98007-05(DRP) | VIO | Inadequate Procedure for Installing AFW Flow Element Orifices |
| 50-306/98007-06(DRP) | VIO | Failure to Promptly Correct Incorrect Acceptance Criteria in AFW Surveillance Test Procedures |
| 50-282/98007-07(DRP<br>50-306/98007-07(DRP) | URI | Possible failure to perform an evaluation in accordance with 10 CFR 50.59 |
| 50-282/98007-08(DRP)<br>50-306/98007-08(DRP) | VIO | Failure to Develop Testing Procedures for a Safety-Related Temporary Modification to the Cooling Water System |
| 50-282/98006 (1-98-06)<br>50-306/98006 | LER | Control Room Vent Outside Air Equipment Qualification |
| 50-282/98007-09(DRP)<br>50-306/98007-09(DRP) | NCV | Control Room Vent Outside Air Equipment Qualification |

Closed

None.

Discussed

None.

LIST OF ACRONYMS USED

| | |
|---|---|
| AFW | Auxiliary Feedwater |
| ASCO | Automatic Switch Company |
| ASME | American Society of Mechanical Engineers |
| CFR | Code of Federal Regulations |
| CR | Condition Report |
| DBD | Design Basis Document |
| DDCLP | Diesel-Driven Cooling Water Pump |
| DRP | Division of Reactor Projects |
| DRS | Division of Reactor Safety |
| EA | Enforcement Action |
| EDG | Emergency Diesel Generator |
| FE | Flow Element |
| FO | Fuel Oil |
| FSAR | Final Safety Analysis Report |
| I&C | Instrument and Control |
| IP | Inspection Procedure |
| IPE | Individual Plant Examination |
| LER | Licensee Event Report |
| MCA | Maximum Credible Accident |
| MSIV | Main Steam Isolation Valve |
| NCV | Non-Cited Violation |
| NRC | Nuclear Regulatory Commission |
| PCR | Procedure Change Request |
| PDR | Public Document Room |
| PM | Preventive Maintenance |
| PORV | Power Operated Relief Valve |
| RP | Radiation Protection Procedure |
| RPIP | Radiation Protection Implementing Procedure |
| SI | Safety Injection |
| SP | Surveillance Procedure |
| TP | Test Procedure |
| TS | Technical Specification |
| URI | Unresolved Item |
| USAR | Updated Safety Analysis Report |
| VCT | Volume Control Tank |
| VIO | Violation |
| WO | Work Order |