

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-282/88005(DRP); 50-306/88005(DRP)

Docket Nos. 50-282; 50-306

Licenses No. DPR-42; DPR-60

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


Facility Name: Prairie Island Nuclear Generating Plant

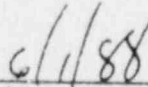
Inspection At: Prairie Island Site, Red Wing, Minnesota

Inspection Conducted: April 3 through May 14, 1988

Inspectors: J. E. Hard

M. M. Moser

Approved By:  B. Burgess, Chief
Reactor Projects Section 2A


Date

Inspection Summary

Inspection on April 3 through May 14, 1988 (Reports No. 50-282/88005(DRP); 50-306/88005(DRP))

Areas Inspected: Routine unannounced inspection by resident inspectors of previous inspection findings, plant operational safety, maintenance, surveillances, ESF systems, LER followup, spent fuel pool activities, design changes and modifications, licensed operator training, meetings with corporate management, and meetings with public officials.

Results: During this inspection period, both units operated continuously at 100% power and in general the plant continues to operate well. As noted in this and previous inspection reports, however, there continues to be a need for continued emphasis regarding paying attention to details. Of the nine areas inspected, one violation was identified in the area of plant operational safety involving a temporary loss of full operability of one of the paths from the grid to safeguards 4KV Bus No. 16. As detailed in Section 3, this was caused during relay work and was the second occurrence of this type in six months. An unresolved item was also identified in Section 3 involving the unplanned autostart of No. 12 and No. 22 diesel cooling water pumps and may involve a procedural error.

DETAILS

1. Persons Contacted

**R. Jensen, Senior Vice President, Power Supply
**C. Larson, Vice President, Nuclear Generation
**F. Tierney, General Manager Nuclear Engineering and Construction
**D. Musolf, Manager Nuclear Support Services
**R. Anderson, Manager Nuclear Analysis
P. Kamman, Superintendent, Nuclear Operations Quality Assurance
**G. Ortler, Manager Corporate Security
**W. Anderson, Assistant Administrator Nuclear Security Services
**T. Bushee, Supervisor Media Services
*E. Watzl, Plant Manager
D. Mendele, General Superintendent, Engineering and Radiation Protection
*R. Lindsey, Assistant to the Plant Manager
M. Sellman, General Superintendent, Operations
D. Schuelke, Superintendent, Radiation Protection
G. Lenertz, General Superintendent, Maintenance
K. Beadell, Superintendent, Technical Engineering
M. Klee, Superintendent, Quality Engineering
R. Conklin, Supervisor, Security and Services
D. Vincent, Project Manager, Nuclear Engineering and Construction
J. Goldsmith, Superintendent, Nuclear Technical Services
*A. Hunstad, Staff Engineer
T. Amundson, Superintendent Training
A. Smith, General Superintendent, Planning and Services
A. Vukmir, Site Services Representative, Westinghouse Electric Corp.
J. DiIanni, License Project Manager, NRR

The inspectors interviewed other licensee employees, including members of the technical and engineering staffs, shift supervisors, reactor and auxiliary operators, QA personnel, Shift Technical Advisors, and Shift Managers.

*Denotes those present at the exit interview of May 16, 1988.

**Denotes NSP Corporate personnel who were visited on April 21, 1988.

2. Licensee Action on Previous Inspection Findings (92701)

(Closed) Open Item (282/86011-03; 306/86013-01(DRP)): Testing of valves during surveillance tests.

Conflicting technical specification (TS) requirements regarding the testing of certain containment spray valves are being resolved by TS revision. See also Section 7, discussion under LER 282/86009-LL.

(Interim report) Open Item (282/85024-04; 306/85022-04): Post-accident Emergency Cooling Water Flow Requirement and Availability.

A significant study by the licensee on the current loads on the cooling water system has been completed. Review of this document has raised questions regarding the ability of a single diesel-powered cooling water pump to provide adequate flow immediately following a loss-of-coolant accident in one unit simultaneous with a loss of offsite power. These questions are being reviewed and discussed with the licensee.

3. Operational Safety Verification (71707)

Unit 1 was base loaded at 100% power except for reductions for surveillance testing. Unit 2 was base loaded at 100% power except for reductions for surveillance testing and load following.

The inspector observed control room operations, reviewed applicable logs, conducted discussions with control room operators, and observed shift turnovers. The inspector verified operability of selected emergency systems, reviewed equipment control records, and verified the proper return to service of affected components. Tours of the auxiliary building, turbine building and external areas of the plant were conducted to observe plant equipment conditions, including potential fire hazards, and to verify that maintenance work requests had been initiated for equipment in need of maintenance.

On March 11, 1988, the routine process of mixing a solution of boric acid in the mixing tank by the auxiliary building plant operators and as requested by the shift supervisor was successfully completed. However, several days later, due to a miscommunication, an additional quantity of boric acid crystals was added to the same solution yielding a boric acid concentration twice as strong as required and resulting in valve blockage from boric acid crystals. The "double batched" boric acid solution was removed and the blockage subsequently cleared away by dilution.

On April 17, 1988, with both units operating at 100% power and all four cooling towers in operation, a ground fault in the auxiliary transformer caused the 10 bank transformer to be removed from service for isolation causing the loss of all four cooling tower pumps. By the time corrective action had been taken, return canal water temperature had increased to approximately 95 degrees F. resulting in a fish kill of approximately 2,500 fish. The licensee will issue a report to the State of Minnesota concerning the fish kill.

On April 21, 1988, with both units operating at 100% power, a plant operator noted that the No. 11 cooling water pump casing was warm. Since the No. 11, No. 21, and No. 121 cooling water pumps were all running, the control room operators suspected that No. 11 cooling water pump had low flow. The operators decided to stop No. 121 cooling water pump to get more flow through No. 11 pump. At 1300 hours, when No. 121 pump was stopped, the No. 12 and No. 22 diesel powered cooling water pumps autostarted upon sensing low cooling water system pressure. Subsequent investigation points to a loss of prime on the No. 11 pump as the cause of the loss of system pressure. It appears that the No. 11 pump may have

lost its prime as a result of a drop in the intake bay water level due to clogged intake gratings from a fish kill in the cooling water return canal as described above.

Control room operators did not follow written procedures when securing the No. 121 pump (i.e., "close the discharge valve prior to stopping the pump") which may have alerted them to the true condition of No. 11 pump. This may be a violation of technical specification, Paragraph 6.5.A.1 and is unresolved pending further investigation (282/88005-01(DRP)).

On April 26, 1988, with both Unit 1 and Unit 2 at 100% power, the automatic transfer capabilities of safeguards Bus No. 16 was lost when a ten amp fuse blew in the 125 volt DC control power circuit. The event occurred when an electrical maintenance relay technician shorted a 125 volt DC circuit associated with the frequency relay for the No. 2 emergency diesel generator. The emergency diesel generator had been removed from service to perform a preventive maintenance inspection. The control circuit fuse was replaced and the bus transfer circuit returned to operable condition within 20 minutes. Technical Specifications Paragraph 3.7.B.3 states in part that "one 4KV bus . . . may be out of service on each unit for a period not to exceed eight hours provided . . . both diesel generators are operable, and both paths from the grid to the 4KV bus are operable." This is a technical specification violation since Bus 16 voltage restoration was inoperable and therefore Bus 16 was inoperable for 20 minutes with No. 2 emergency diesel generator also out of service. See Notice of Violation (282/88005-02(DRP)). The conditions surrounding this violation are nearly identical to a similar event which occurred on October 28, 1987, as relays for the No. 1 emergency diesel generator were being tested. Corrective actions found to be needed as a result of the 1987 event had not been implemented at the time of the 1988 event.

During the week of May 2, 1988, the monthly reactor protection and safeguards channel test surveillance was being performed. When testing was resumed on the next day, it was discovered that the rotary defeat switch had inadvertently been left in white channel defeat for overtemperature delta T alarm from the previous day's activity. No violation of technical specifications occurred.

4. Maintenance Observation (62703)

Routine, preventive, and corrective maintenance activities were observed/reviewed to ascertain that they were conducted in accordance with approved procedures, regulatory guides, and industry codes or standards, and in conformance with Technical Specifications. The following items were considered during this review: the limiting conditions for operation were met while components or systems were removed from service, approvals were obtained prior to initiating the work, activities were accomplished using approved procedures and were inspected as applicable, functional testing and/or calibrations were performed prior to returning components or systems to service, quality control records were maintained, activities were accomplished by qualified personnel, radiological controls were implemented, and fire prevention controls were implemented.

During the week of April 3, 1988, the No. 12 diesel driven cooling water pump was removed and replaced with a pump of an improved design. This vertical shaft cooling water pump is one of three vertical shaft cooling water pumps (two diesel driven and one motor driven) which take cooling water from the emergency bay and discharge to a common header. The pump is a Worthington single speed, single stage, double suction design rated at 12,000 gpm with a drive shaft and support structure 41 feet tall. Specific design improvements included additional pump shaft support bearings to minimize bearing wear and vibration. After pump replacement, the new pump was tested in accordance with ASME Section XI and met the pump head-capacity performance requirements.

During the week of April 24, 1988, emergency diesel generator No. 2 was taken out of service for its annual preventive maintenance (PM) inspection. Inspection of all crankshaft bearings found them to be acceptable (i.e., they passed the "gap check") after having logged two dry starts since the last PM. Inspection of the blower found excessive lobe clearance mismatch due to an apparent mechanical problem and the blower was replaced. While replacing the lower vertical shaft upper thrust bearing per a Fairbanks Morse Service Bulletin, it was found that the lower shaft bearing surfaces were undersize and the shaft was replaced. All of the injector pumps were replaced with pumps of an improved design. After detailed inspections and repairs were made, the diesel generator was successfully tested and returned to service.

Other maintenance activities observed during this inspection period included:

- No. 12 auxiliary feedwater pump line flushing
- No. 2 diesel generator heat exchanger flushing
- Eddy current inspection of No. 2 diesel generator heat exchangers
- Old screenhouse intake trash rack cleaning

No violations or deviations were identified.

5. Surveillance (61726)

The inspector witnessed portions of surveillance testing of safety-related systems and components. The inspection included verifying that the tests were scheduled and performed within Technical Specification requirements by observing that procedures were being followed by qualified operators, that Limiting Conditions for Operation (LCOs) were not violated, that system and equipment restoration was completed, and that test results were acceptable to test and Technical Specification requirements.

Portions of the following surveillances were observed/reviewed during the inspection period:

—	SP 2713	Unit 2 Annual Calibration of Safety Injection Recirculation Doppler Flow Meters
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- SP 2032 Unit 2 Reactor Safeguards Logic Test
- SP 1054 Unit 1 Turbine Valves Test
- SP 1106B No. 22 Diesel Cooling Water Pump Test
- SP 1728 Siren Cancel Test
- SP 2168 Unit 2 Safety Injection (SI) Pump Leak Check
- SP 2093-1 Diesel Generator No. 2 Manual and 4 KV Rejection-Restoration Scheme Test
- SP 1006 Unit 1 Nuclear Power Range Axial Offset Calibration
- SP 1655 Security Fence E-Field Test

No violations or deviations were identified.

6. ESF System Walkdown (71710)

The inspector performed a complete walkdown of the accessible portions of Unit 1 and Unit 2 Residual Heat Removal (RHR) systems. Observations included confirmation of selected portions of the licensee's procedures, checklists, plant drawings, verification of correct valve and power supply breaker positions to insure that plant equipment and instrumentation are properly aligned, and local system indication to insure proper operation within prescribed limits.

No violations or deviations were identified.

7. Licensee Event Reports Followup (92700)

Through direct observations, discussions with licensee personnel, and review of records, the following event reports were reviewed to determine that reportability requirements were fulfilled, immediate corrective action was accomplished, and corrective action to prevent recurrence had been accomplished in accordance with Technical Specifications:

(Closed) LER 282/86009-LL: Testing of valves between refueling water storage tank and containment spray system.

Motor-operated valves, two for each unit, which connect the refueling water storage tank to the containment spray pumps, are tested for operability each refueling outage as required by the plant Inservice Inspection and Testing Program and Technical Specification (TS) 4.5.B.3.f. A second TS, 4.5.B.3.a, requires that these same valves be tested in performing the monthly containment spray pump tests. However, since the valves are usually open and since, lacking manual control switches, special electrical jumpering is required to operate them, valve testing traditionally has not been done monthly. While efforts are ongoing to clarify the

technical specification requirements, a plant modification has been prepared to install control switches for these valves. This modification is to be completed simultaneous with Control Room A Panel replacements during the 1990 refueling outages.

(Closed) LER 282/85013-LL: Failure of Feedwater Motor Operator

Attempts to open a motor-operated main feedwater containment isolation valve during reactor startup resulted in overheating and damaging the motor operator and tripping of the feeder breaker to its motor control center (MCC). In addition to the motor overload relays failing to protect the operator, there was improper electrical protection coordination between the operator and the MCC. Corrective actions taken included:

- a. Investigation of load coordination between MCC feederbreakers and load breakers. All "Appendix R" loads have been appropriately coordinated, including the motor-operated valves.
- b. Instructions to plant operators for resetting of breakers have been clarified.

8. Spent Fuel Pool (SFP) Activities (86700)

As noted in Inspection Reports No. 282/87016(DRP) and No. 306/87015(DRP), the fuel rod consolidation demonstration program was successfully completed on November 13, 1987. The final phase of this program is to crush and ship the empty fuel assembly cages (a total of 39) left from the consolidation program and other activities as part of Modification 87L019 and included a safety evaluation of this activity. In order to accommodate the cage crushing equipment, three fuel racks weighing 13 tons each were lifted from the SFP using a special crane and removed to the radwaste storage warehouse. A special wearplate has been installed in the SFP to support the cage crushing equipment and also protect the pool liner. Cage crushing is scheduled to begin May 23, 1988.

In conjunction with the activities in the SFP, on April 22, 1988, SFP cooling heat exchanger valve repair work resulted in a gradual rise in SFP temperature. Due to mechanical malfunction of the temperature switch contacts, the SFP high temperature alarm (at 120 degrees F.) was not received. SFP temperature reached 135 degrees F. before this situation was discovered. A work request has been issued and a new solid state temperature switch will be installed.

9. Design Changes and Modifications (37700)

A recent review of a modification (81Y174) involving the addition of a safeguards 480 volt transfer switch and load center has identified a deficiency in the analysis that was performed for this work. Specifically, it appears that a technical review of the motor control center (MCC) 1AB1 voltage drop caused by the added electrical cable loads was not properly performed. A technical review of this question

found the existing cabling to be marginally acceptable provided certain load configurations were followed. As an interim measure, a Prairie Island Operations Temporary Memo was issued until permanent changes can be made to correct this condition. This is considered an open item pending permanent corrective action (282/88005-03(DRP)).

10. Licensed Operator Training (41701)

At the request of the licensee, the resident inspectors have prepared and presented to the operating crews an overview of the NRC, a brief history, its mission, the resident inspector program and briefly what resident inspectors do at Prairie Island. The informal discussion has allowed the operators an opportunity to gain insight and understanding of the role of the NRC/Resident Inspectors at nuclear power plants and at the same time has provided the resident inspectors a forum in which to stress reactor plant safety and the key role that plant operators play. Feedback from this program has been positive and may be followed by subsequent sessions addressing current topics of interest.

11. Meeting with Corporate Officials

On April 21, 1988, the senior resident inspector met with NSP corporate officials listed above to discuss the following subjects:

- Plant projects
- New diesel-generators
- New administration building
- Relocation of Secondary Alarm Station
- Separation of combined systems - cooling water, component cooling
- Prairie Island Plant staffing
- Attributes of a well-run nuclear plant
- Activities of Corporate QA group
- Response-time testing of safety instrumentation - Plans for region-based inspector visit.
- Proposed NRC rule on not announcing presence of inspectors in plant
- Chairman's visit on May 15-26
- Control of work in switchyards
- Fitness-for-Duty rule

12. Meeting with Public Officials (94600)

At 9:30 a.m. on May 12, 1988, an informational public meeting was held with the Minnesota Public Utilities Commission to discuss and review of the status of the spent fuel consolidation project at Prairie Island Nuclear Power Plant. The Minnesota Public Utilities Commission requested the meeting with the NRC to become more familiar with the NRC regulation of Northern States Power Nuclear Plants. NRC participants included NRC Region III responsible branch and section chiefs, the Prairie Island resident inspector and the NRR Licensing Projects Manager for Prairie Island.

13. Exit (30703)

The inspectors met with the licensee representatives denoted in Paragraph 1 at the conclusion of the inspection on May 16, 1988. The inspectors discussed the purpose and scope of the inspection and the findings. The inspectors also discussed the likely information content of the inspection report with regard to documents or processes reviewed by the inspector during the inspection. The licensee did not identify any document/processes as proprietary.