U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-282/83-22(DE); 50-306/83-22(DE)

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 Plants, Unit 1 & 2

Inspection At: Red Wing, MN

Inspection Conducted: November 7 and 10, 1983, and March 19 and 20, 1984

Inspector: J. F. Streeter 5/31/84
Date

Approved By: R. L. Spessard, Director 5/31/84
Division of Engineering Date

Inspection Summary

Inspection on November 7 and 10, 1983, and March 19 and 20, 1984 (Reports No. 50-282/83-22(DE); 50-306/83-22(DE))
Areas Inspected: Special, announced inspection by region-based inspector of degraded voltage protection measures. The inspection involved a total of 20 inspector-hours on site and 20 inspector-hours in office by one NRC inspector including 0 inspector-hours on site during off-shifts.
Results: One item of noncompliance was identified (failure to perform and document a 50.59 safety evaluation - Paragraph 4).

DETAILS

1. Persons Contacted

*J. L. Hoffman, Superintendent, Technical Engineering
*D. J. Mendele, Plant Superintendent, Engineering and Radiation Protection
D. M. Musolf, Manager Nuclear Support Services
J. C. Ruether, Computer Engineer
E. L. Watzl, Plant Manager

The inspector also talked with licensed operators on duty in the control room.

*Denotes those present at the exit interview on March 20, 1984.

2. Background

On August 1, 1983, an event occurred at the Monticello Nuclear Generating Station which involved the actuation of the degraded voltage protection relays on a 4160 volt essential bus. These relays had been installed as a result of NRC positions established subsequent to electrical distribution system problems that surfaced during an event at the Millstone 2 facility in July 1976. Since degraded voltage protection relays had also been installed at the Prairie Island Nuclear Generating Plant, this special inspection was conducted to determine if Prairie Island was susceptible to the same problems that were identified during the inspection of the Monticello event.

3. Degraded Voltage Protection Relays

The inspector determined that the relays installed at Prairie Island were different than the relays installed at Monticello and were not susceptible to the reset span problem encountered at Monticello.

No items of noncompliance or deviations were identified.

4. Electrical Distribution System Analysis

As a result of a September 1978 event at Arkansas Nuclear One, NRR requested in a August 8, 1979, generic letter that Northern States Power Company conduct a thorough analysis of the adequacy of the onsite distribution of power from the offsite power circuits. The licensee conducted an analysis which was submitted to the NRC on July 17, 1981, and which was reviewed by a contractor for the NRC. The results of the NRC contractor review were the subject of a Technical Evaluation Report (TER) which was endorsed by NRR in a Safety Evaluation (SE). The TER and SE found the licensee's analysis and corrective actions acceptable, and the TER and SE were transmitted to the licensee by an NRR letter dated October 29, 1982.

The licensee's analysis assumed a set of what the licensee thought to be the most pessimistic conditions that would be encountered with a heavily loaded grid. Those assumptions yielded pre-trip values of 168 ± 1 KV and 351 ± 3 KV on the 161 KV and 345 KV grids respectively. The minimum voltage analysis was based on post-trip values of 164.2 KV and 345 KV on the 161 KV and 345 KV grids respectively. These values in turn yielded a minimum 4160 V bus voltage under the analyzed worst case loading conditions that was above the upper setpoint tolerance (3827 V = 92%) of the degraded voltage protection relays.

The inspector reviewed computer logs for July 5 and August 1, 1983, and determined that on those dates the 161 KV and 345 KV grids were never lower than 166 KV and 348 KV, respectively, and were therefore at or above the minimum pre-trip values assumed in the analysis. The inspector requested the licensee to review additional historical grid data to determine if the grids had ever been below the minimum assumed values. The licensee reviewed data for 1983 and determined that on January 12, February 27, April 2, and May 8, 1983, the 345 KV grid voltage was between 342 KV and 345 KV. (At the request of the inspector, the licensee reviewed these specific occasions and determined that the 345 KV power source had sufficient capacity to ensure proper 4150 V bus voltages under the worst case loading conditions analyzed.) The licensee determined that the 161 KV grid voltage was always maintained at 168 ± 2 KV.

Although the minimum assumed grid voltage values in the licensee's July 17, 1981, analysis were not specifically addressed in the text of the Updated Safety Analysis Report (USAR), the licensee's analysis was incorporated in the USAR as Reference 2 of Section 8.10 on Page 8.10-1. Therefore, the provisions of 10 CFR 50.59 apply and a written safety evaluation should have been completed prior to operating below the minimum assumed value for the 345 KV grid. Failure to conduct and document a safety evaluation in accordance with 10 CFR 50.59 is considered to be an item of noncompliance (282/83-22-01; 306/83-22-01). (Although the licensee failed to conduct and document a 50.59 safety evaluation, the licensee did provide information that indicated the licensee had made some effort prior to the Monticello event to determine minimum acceptable grid voltages and had determined that pre-trip voltages substantially less than 166 KV and 348 KV were acceptable under certain conditions. This licensee determination has since been documented in some detail and has been reviewed by and concurred in by NRR, subject to the satisfactory documentation of all design changes discussed in a March 16, 1984, letter from the licensee to NRR. The licensee has already documented some of the design changes in Section 8 of the USAR and will assure all of the design changes are documented in the USAR.)

No other items of noncompliance or deviations were identified.

5. Bus Voltage Controls and Revised Analysis

Prior to the Monticello event the Prairie Island Control Room had several computer alarms to alert personnel to abnormal voltage conditions. The computer alarms were as follows:

Parameter	Low Alarm	High Alarm
Generator Output Voltage	19 KV	21 KV
Generator MVARs	250 MVARS (Receiving)	250 MVARs (Delivering)
4610 V Busses 15, 16, 25 and 26	3900 V	4400 V
345 KV Bus	348 KV	354 KV
161 KV Bus	166 KV	170 KV

There were no written procedures in place to direct Control Room personnel actions in correcting abnormal voltage conditions. Licensee personnel stated that if an alarm was received Control Room personnel would request assistance from the plant technical section and the System Dispatcher, if necessary.

Subsequent to the Monticello event the licensee issued on August 19, 1983, Special Order No. 216, "Operating Voltage Limits," to give procedural direction to operators to ensure the adequacy of offsite power sources. This order defined the lower boundary of the normal operating regions for the 161 KV and 345 KV grid voltages as 162.5 KV and 334 KV, respectively, under specified distribution system alignments. The provisions of the order were based in large part on draft Procedure C20.1, "Integrated Systems Operation," which had been under development for some time.

The inspector requested the licensee to (1) perform a safety evaluation to determine the acceptability of the allowable ranges contained in Special Order No. 216 for the 161 KV and 345 KV bus voltages,and (2) send the safety evaluation to NRR for a technical review. On December 8, 1983, the licensee submitted the safety evaluation (Safety Evaluation No. 114) to NRR. NRR reviewed the safety evaluation which included a revision of the licensee's July 17, 1981,analysis of the adequacy of station electric distribution system voltages. NRR informed Region III of its conclusion that the licensee's analysis was acceptable in that it demonstrated that the offsite power sources in conjunction with the onsite distribution system have the necessary capacity and capability to supply adequate voltage to ensure proper operation of Class 1E equipment in performing their safety functions under the worst case conditions analyzed.

The inspector also requested the licensee to upgrade Special Order No. 216 to improve operator guidance. On December 7, 1983, the licensee superseded Special Order No. 216 with Special Order No. 219, "Operating Voltage Limits," which provided much more detailed guidance and which documented revised computer alarms for the 161 KV and 345 KV buses (161 KV Bus - Low 165 KV, High 171 KV; 345 KV Bus - Low 344 KV, High 355 KV). Special Order No. 219 was in turn superseded by Special Order No. 223 having the same title on March 9, 1984. The inspector toured the Control Room on March 19, 1984, and discussed the provisions of Special Order 223 with licensed personnel on shift. The inspector concluded that clarifying instructions for operating personnel were needed to explain the purpose and use of the attachments to the order. On March 23, 1984, the licensee issued a memorandum to Control Room personnel which clarified the use of the attachments.

The inspector has no further questions regarding the acceptability of allowable system voltages or regarding the adequacy of the controls implemented to assure those voltages are maintained.

No items of noncompliance of deviations were identified.

6. Assumptions in Analyses Submitted to the NRC

The inspector discussed with licensee representatives of the corporate office and the plant the general area of how the licensee views assumptions in analyses submitted to the NRC. The corporate view as documented in Paragraph 4 of Region III Inspection Report (Monticello) Number 50-263/83-23(DE) is that assumptions in such analyses are not operational constraints unless the assumptions are clearly identified as operating limits in technical specifications or other correspondence with the NRC. The Prairie Island plant view is more conservative and considers those same assumptions to be operational constraints unless subsequent licensee evaluations of the assumptions indicate the assumptions can be relaxed.

No items of noncompliance or deviations were identified.

7. RWST Maximum Temperature

The inspector informed the licensee of a problem at another facility involving a maximum refueling water storage tank (RWST) temperature which was assumed in the ECCS analysis submitted to the NRC. In that case the licensee did not implement controls for the maximum temperature since the maximum temperature was not a Technical Specification requirement. Consequently, the licensee exceeded the accident analysis assumption without conducting a 50.59 safety evaluation. The inspector asked the licensee to determine if the Prairie Island ECCS analysis contained a maximum RWST temperature assumption. The licensee reviewed the matter and determined that the ECCS analysis did not have such an assumption.

No items of noncompliance or deviations were identified.

8. Exit Interview

The inspector met with licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection. The inspector summarized the scope and findings of the inspection.