U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-263/87009(DRS)

Docket No. 50-263

License No. DPR-22

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

Facility Name: Monticello

Inspection At: Monticello, Minneapolis

Inspection Conducted: June 17-18 and July 6, 1987

Rolf A. Westberg

Inspector: Rolf A. Westberg

7/20/87

Date

Ronald N. Gardner

Approved By: Ronald N. Gardner, Chief
Plant Systems Section

7/20/87

Date

Inspection Summary

Inspection on June 17-18 and July 6, 1987 (Report No. 50-263/87009(DRS))

Areas Inspected: Special safety inspection by one regional inspector of onsite followup of events at operating reactor (93702).

Results: Two apparent violations were identified. (Failure to meet requirements of 10 CFR 50.59, Paragraph 2b(2); and failure to have a procedure for plant electrical coordination studies, Paragraph 2b(3)).

DETAILS

1. Persons Contacted

Northern States Power Company (NSP)

W. Shamla, Plant Manager
J. Nystrom, Senior Production Engineer
S. Engelke, Lead Production Engineer
C. Larson, Vice President, Nuclear
L. Eliason, General Manager, Nuclear
M. Clarity, Assistant to the Plant Manager
D. Nevinski, General Superintendent, Energy and Radiation Protection

USNRC

P. Hartmann, Senior Resident Inspector

2. Review of Unusual Event Caused by Solid State Trip Device and Fuse Mis-Coordination

Event Summary

On June 16, 1987, the licensee declared an unusual event after concluding that the ongoing problems with the electrical ground fault protection devices on the 480 volt load centers could result in a common mode failure. This event was preceded by events on June 7 and June 14, 1987, where the ground fault device on Load Center Breaker No. 52-404 tripped and de-energized Motor Control Center (MCC) No. 143A which contained Emergency Core Cooling system (ECCS) equipment, including components of the B train core spray and the residual heat removal systems.

Ground fault detection devices are solid state devices designed to protect or trip the feed to an individual piece of equipment when a significant short to ground is detected. The ground fault device on the load center breaker should not have tripped unless there was a ground fault on the cables feeding the MCC. That the load center breaker tripped instead of the protective device at the load was identified by the licensee as a coordination problem. The solid state ground fault devices sense a ground fault in six to thirteen cycles (approximately .2 seconds) while the protective fuse at the load requires several seconds before it blows.

The June 7 event and the June 14 event were determined to be caused by an intermittent ground fault in one of the four drywell cooling fans. The licensee has jumpered out the ground fault detecting devices which placed the plant in the same condition as the original design.

The purpose of this report is to document the NRC staff's review of this event.

a. <u>Documents Reviewed</u>

(1) Department Procedure No. MT-PP7.72, "Monticello Nuclear Plant General Electric Class I 480 V Breakers Mechanical and Electrical Maintenance," Revision 3.

(2) Administrative Control Document No. ACD-7.3, "Safety Review Item," Revision 1.

(3) Corporate Nuclear Administrative Work Instruction No. N1AWI 5.1.3, "Design Inputs," Revision 2.

(a) Figure 1 No. E7, "Relay Protection Schemes Review by Protection and Electrical Maintenance."

(b) Maintenance of Electrical Protective Coordination for Safe Shutdown Systems.

(4) IB No. 33-850-7, "Instructions for the Retrofit of GE AK-2/2A-25,50 and 75 Low Voltage Breakers."

(5) Operations Committee Meeting Minutes.

(a) No. 1416, "Review of Safety Review Item, SRI No. 86-013, Trip Device Replacement 480 V Load Center and MCC's; and the Associated Procedures," April 24, 1986.

(b) No. 1497, "Discussion to Determine Course of Action Following Discovery of Breakers Mis-Coordination Problem," June 16, 1987.

(6) Work Request Authorization No. 87-01595, "Install Jumpers in Load Center 103 and 104," dated June 16, 1987.

(7) QC Inspection No. 87-259, "Work Request Authorization No. WR8 87-01595."

(8) Safety Review Item SRI No. 86013, "Trip Device Replacement 480V Load Centers and MCCs," dated May 30, 1986."

(9) Memo from C. R. Russell, General Manager, Maintenance and Testing to J. H. Nystrom, Senior Production Engineer, "Replacement of Class 1E 480 Series Trip Devices at Monticello Plant," dated June 17, 1985.

(10) Drawing No. NF-36175, "Single Line Diagrams Station Connections," Revision E.

b. Inspection Results

(1) Background

The retrofit of the Monticello plant's General Electric (GE) AK-2/2A type electrical breakers with Westinghouse Amptector solid state overcurrent trip devices started in 1983 when engineering investigated replacing the existing EC2A type electromagnetic overcurrent trip devices. After a demonstration of the solid state units at an INPO workshop, serious discussions were conducted with Westinghouse in September 1984 which led to the issue of the purchase order for the Amptector retrofit kits in June of 1985.

The Amptector Units were installed during the May 1986 refueling outage. Because of the lead time involved, Westinghouse could not supply the Amptector IIA Units (without ground fault protection) and supplied Amptector IA Units (with ground fault protection) for the same price.

Since the Amptector Units were being installed in order to achieve higher reliability, more precise overcurrent trip settings, and reduced maintenance, the ground fault detection feature of these units was wired into the breaker trip circuit because it provided an additional level of overcurrent protection.

The Amptector installation was put into service after testing in August of 1986 and operated without incident until the June 7, 1987 event.

(2) Examination of the Trip Device Replacement Safety Review

The inspector examined Safety Review Item (SRI) No. 86-013, "Trip Device Replacement 480V Load Centers and Motor Control Centers (MCCs)" dated August 20, 1986, to determine if the licensee had properly implemented their procedures and met the requirements of 10 CFR 50.59. During this examination the inspector determined the following:

(a) SRI No. 86-013 addressed only the phase overcurrent trip capabilities of the IIA type Amptector Units. It did not address the ground fault detection circuitry associated with the IA type Amptector Unit. SRI No. 86-013 was an acceptable safety review and did not involve an unreviewed safety question if the plant had received the IIA type Amptectors. Since the IIA devices do not have ground fault capabilities, they would have been a direct replacement for the existing EC2A electromechanical trip devices. Consequently, no license amendment or unreviewed safety question would have been required.

(b) When the plant received the IA type Amptectors, the modification package should have been revised to analyse the effect of installing the Amptector devices with ground fault protection. Further, the N1AWI 5.0 series of procedures for modification and maintenance and Administrative Control Document No. 4 ACD-7.3," Safety Review Item," require safety evaluations for new changes/ modifications and their subsequent revisions to address the requirements of 10 CFR 50.59. The failure of the licensee to recognize that the installation of the Amptector devices with ground fault protection capabilities required a new safety evaluation led to their installation in the plant and the plant's subsequent operation for 11 months in an unanalyzed condition.

(c) The installation of the Amptector devices with ground fault protection capabilities constituted an unreviewed safety question because it increased the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the safety analysis report.

The Amptector devices were installed on load centers No. 103 and No. 104 which supply power to 480v MCCs which supply safety related and nonsafety-related equipment. The non safety-related equipment has not been qualified for operation in harsh environments, seismic events, flooding, or fire. Therefore, under these conditions, ground faults occurring in non safety-related equipment could trip the Amptector at the load centers thereby disabling both trains of ESF systems.

The Amptector range of time delay prior to tripping is adjustable from 0.22 to 0.5 seconds. Since this time period is generally faster than the fuses and overload heaters employed for equipment protection, the Amptector would always trip first and de-energize the load centers.

(d) The unreviewed safety question became apparent as a result of the June 7 and June 14, 1987 events.

(e) The licensee's corrective action, to jumper out the Amptector ground fault capabilities on June 16, 1987, and the subsequent modification to make the jumpers permanent, was taken since proper coordination could not be achieved between the Amptector and the existing protective devices.

The failure of the licensee to perform a safety review of the installation of the Amptector devices with ground fault protection and the operation of the plant for 11 months with an unreviewed safety question is an apparent violation of 10 CFR 50.59.

(3) Examination of Design Control Relative to Protective Device Coordination

The inspector reviewed the design control interface procedures, the breaker setting card for MCC No. 143A, and Item No. E15 from the design change items to consider file titled "Maintenance of Electrical Protective Coordination for Safe Shutdown Systems." In addition, interviews were conducted with personnel relative to the events. This review determined the following results:

(a) The coordination study by Electrical Protection Engineering (EPE) specified the ground fault detection settings based on the MCC supply breakers only (upstream). They assumed incorrectly that the plant had considered the coordination relative to the MCC loads (downstream).

(b) There was no approved procedure for the performance of plant electrical coordination studies.

The failure of the licensee to have a procedure for the performance of electrical coordination studies is an apparent violation of 10 CFR 50, Appendix B, Criterion V.

(4) Plant Tour

The inspector reviewed Work Request No. 87-01595 and Quality Control Inspection No. 87-259 which installed and inspected the temporary jumpers on the Amptector devices which defeated the ground fault detection capabilities. The inspector also toured the plant and verified the installation of the jumpers.

3. Exit Meeting

The inspector met with licensee representatives (denoted in Paragraph 1) at Monticello on June 18, 1987, and summarized the purpose, scope and findings of the inspection. The inspector discussed the likely informational content of the inspection report with regards to documents or processes reviewed by the inspectors during the inspection. The licensee did not identify any such documents or processes as proprietary.