U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-282/87004(DRS); 50-306/87004(DRS)

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

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

Facility Name: Prairie Island Nuclear Generating Plants, Unit 1 & 2

Inspection At: Red Wing, Minnesota

Inspection Conducted: March 2-6, and April 10, 1987

Inspectors: K. Sullivan 4-15-87
Date

M. Villaran 4-15-87
Date

J. Ulie 4-15-87
Team Leader Date

Approved By: R. Gardner, Chief 4-15-87
Plant Systems Section Date

Inspection Summary

Inspection on March 2-6, and April 10, 1987 (Reports No. 50-282/87004(DRS); No. 50-306/87004(DRS))
Areas Inspected: Special announced inspection by a Region III based inspector and their consultants to determine licensee implementation of and compliance to the requirements of 10 CFR 50, Appendix R (Sections III. G, J, L, and O). This inspection was conducted in accordance with Inspection Procedures 30703, 37700, 37701, 41700 42700, 64704, and 72701 through Temporary Instruction (TI) 2515/62.
Results: Of the areas inspected, no violations were identified in seven areas; two violations were identified in the remaining two areas (lack of breaker coordination and redundant fusing relative to associated circuits - Paragraph 6; no emergency lighting units installed in two areas of the plant - Paragraph 8).

DETAILS

1. Persons Contacted

Northern States Power

*K. Albrecht, Director, Power Supply Quality Assurance
*K. Beadell, Superintendent, Quality Engineering
B. Berghammer, Plant Services Supervisors
*D. Brown, Senior Production Engineer
E. Burke, Senior Production Engineer
*J. Curtis, Engineer
J. Early, Radiation Protection Specialist
*L. Eliason, General Manager, Nuclear Plants
B. Gauger, Instrument and Control Supervisor
D. Gehlhar, Instrument and Control Technician
G. Goering, Manager, Nuclear Technical Services
J. Gosman, Lead Plant and Equipment Operator
R. Hansen, Lead Production Engineer
*J. Hoffman, Superintendent, Technical Engineering
*A. Hunstad, Staff Engineer
*M. Johnson, Production Engineer
M. Klee, Nuclear Engineering Superintendent
*R. Lindsey, Plant Superintendent, Operations and Maintenance
J. Maki, Engineer
*D. Mendele, Plant Superintendent, Engineering and Radiation Protection
G. Miller, Superintendent, Operations Engineering
*T. Pickens, Senior Nuclear Safety and Technical Systems Engineer
*R. Pond, Senior Electrical Engineer
H. Raway, Instrument and Control Specialist
M. Reddeman, Technical Support Training Supervisor
D. Schuelke, Superintendent, Radiation Protection
*D. Silvers, Principal Production Engineer
*D. Vincent, Manager, Plant Projects
D. Wagenmann, Plant Equipment and Reactor Operator
*E. Watzl, Plant Manager
*M. Werner, Senior Technical Instructor
G. Woodhouse, Shift Supervisor

Gasser Associates

*M. Gasser, Systems Engineer
*C. Kreutz, Licensing Engineer
*E. Michel, Staff Engineer

Impell

N. Lane, Supervising Engineer

American Electric Power/D. C. Cook Plant Representatives

*A. Auvil, Licensing and Safety Engineer
*P. Jacques, Fire Protection Coordinator

USNRC

*D. DiIanni, Project Manager, NRR
*J. Hard, Senior Resident Inspector
*M. Moser, Resident Inspector

The inspectors also contacted other licensee personnel during the inspection visit.

*Denotes persons attending the exit interview of March 6, 1987.

2. Background Information

According to an NRC letter dated November 24, 1980, to the licensee, the Sections of Appendix R that are applicable to the fire protection features of the Prairie Island Plant are divided into two categories. The first category consists of Sections III.G, Fire Protection of Safe Shutdown Capability; III.J, Emergency Lighting; and III.O, Oil Collection Systems for Reactor Coolant Pump which are required to be backfitted in their entirety by the rule regardless of whether or not alternatives to the specific requirements of these Sections have been previously approved by the NRC staff. The second category of Appendix R Sections applicable to the fire protection features of the facility consist of requirements concerning the "Open" items of previous NRC staff fire protection reviews of the Prairie Island Plant. An "Open" item is defined as a fire protection feature that has not been previously approved by the NRC staff as satisfying the provisions of Appendix A to Branch Technical Position (BTP) APCSB 9.5-1, as reflected in a staff fire protection safety evaluation report. The fire protection features of the Prairie Island facility that are in this category must satisfy the specific requirements of Appendix R by the dates established by Paragraph 50.48(c), unless an exemption from the Appendix R requirements on those features were approved by the Commission. Those "Open" items regarding Appendix R for the Prairie Island Plant included the Alternate Shutdown Capability and Safe Shutdown Analysis of Section III.L as related to Section III.G of the Rule. Due to the interrelationship between Sections III.G and L, the inspectors' detailed review of these Sections has been documented together in Paragraphs 3 through 6 of this report.

In a letter dated May 7, 1985, NRR extended the Appendix R schedule at Prairie Island for completing modifications to meet the above requirements to June, 1985. The above two listed categories of applicable Appendix R Sections were those reviewed during this inspection visit and which are discussed in detail in this report.

As related to the above two listed categories, the licensee, by letters dated June 30, October 22, and December 22, 1982; February 17, March 11, May 16, and September 2, 1983; January 23, April 5, and May 22, 1984, requested thirteen technical exemptions from the requirements of Sections III.G, J, and O of Appendix R. In response to these requests, the NRC by letters dated February 2, and May 4, 1983; January 9, and July 31, 1984, approved these exemption requests. However, by letter dated June 9, 1986, the licensee informed the NRC that the exemption approved for Fire Area 37 is no longer applicable due to relocation of certain safe shutdown components. As part of this inspection effort seven of the plant areas having been granted exemptions were examined as detailed in the report.

3. Systems Required For Safe Shutdown

The systems are grouped according to the performance goals for PWR safe shutdown functions to achieve both hot standby and cold shutdown.

a. Reactivity Control

Upon notification of a major fire, initial reactivity control is provided by inserting control rods via operator initiation of a reactor manual trip of both the Unit 1 and 2 reactors from the main control room. The reactors may also be tripped from outside the control room by either locally tripping the turbines or opening Reactor Protection System (RPS) supply breakers.

Following control rod insertion, hot subcritical conditions are achieved for forty-two (42) hours with no addition of boron, assuming the most reactive control rod is stuck in the withdrawn position. As Xenon decays following the reactor scram, addition of 1950 ppm borated water from the Refueling Water Storage Tank (RWST) is required to offset the added positive reactivity to maintain the required shutdown margin.

b. Reactor Coolant Makeup

Reactor Coolant System (RCS) makeup and boron concentration control are normally provided by the Chemical and Volume Control System (CVCS). For a post fire safety shutdown, borated makeup water will be supplied to the RCS via either the A-Division charging pump or the B-Division safety injection (SI) pump.

The A-Division charging pump is powered from the A-Division diesel generator (DG) and is normally aligned to take suction from the Volume Control Tank (VCT). During post fire safe shutdown, the suction source is manually transferred to the RWST by procedure. The RWST is administratively controlled to maintain greater than the Technical Specification (TS) boron concentration limit of 1950 ppm. Discharge from the charging pump is supplied to the RCS via two flow paths: the seal water injection lines which are normally lined up

with the reactor coolant pump (RCP) seals during plant operation, and the normal charging line which is aligned to the RCS cold leg during plant operation.

The B-Division SI pump is powered from the B-Division DG. The pump has a shutoff head of about 2150 psia and takes suction from the RWST through a normally closed motor operated valve also powered from the B-Division safeguards power system. The pump discharge is normally aligned to its SI flow path to the RCS.

c. Decay Heat Removal

Decay heat will be removed from the reactor following a scram via the steam generators (SGs) by natural circulation. Feedwater is supplied to the SGs by the Auxiliary Feedwater (AFW) System to provide makeup for the inventory discharged as steam from the SG power operated relief valves (PORVs) and the backup safety relief valves (SRVs).

Each generating unit has an AFW system supplied by two independent AFW pumps; one pump is steam turbine driven and the other is motor driven, powered from the A-Division safeguards supply for one unit and the B-Division safeguard supply for the other. One AFW pump and one SG is required to remove decay heat from each units RCS. The discharge from each generating unit's motor driven AFW pump may be manually valved to supply the other unit's system.

Each steam turbine driven AFW pump will auto start upon loss of main feedwater pumps. The control logic is powered from a DC uninterruptible power source. Steam to drive the AFW pump turbines can be supplied from either of the two SGs associated with that generating unit. The turbine driven AFW pumps require no electrical power for operation, and they may be manually started locally if necessary. Turbine lube oil is supplied by either an auxiliary lube oil pump, which is run daily to ensure sufficient lubrication for turbine startup, or a shaft driven oil pump which supplies lubrication during operation.

The motor driven AFW pumps are powered from their associated emergency DG safeguards power supply. The pumps auto start upon loss of main feedwater or low SG level. The lube oil pump supplying each motor driven AFW pump is powered from the same safeguards power division as the pump it is supporting.

The AFW pumps suction header is supplied from two water sources: (1) the Condensate Storage System and (2) the Cooling Water System. The header is normally aligned to the Unit 1 Condensate Storage Tank (CST) and the two Unit 2 CSTs which are administratively maintained to greater than the minimum TS capacity of 100,000 gallons. The cross-connect valve between Unit 1 and Unit 2 sides of the header may be operated locally. Upon depletion of the CSTs, the AFW system may be realigned to the Cooling Water System as a backup supply.

Supply valves to the pump suction are motor-operated and powered from safeguards buses. The AFW to SG containment isolation valves are maintained in a locked open position with the supply breakers also locked open. AFW pump discharge valves are maintained in the open position. These valves can be manually locally controlled to regulate feedflow to the appropriate SG.

One PORV is available for each SG for controlled release of steam to ensure control of the RCS cooldown rate. These valves are air-operated and have hand-wheels for manual operation. Power to each of these valves is supplied from a separate instrument inverter. In addition, each SG is equipped with five self-actuating steam safety valves to assure a heat transfer path to the environment. These valves automatically open at a predetermined pressure and require no external actuation.

d. Process Monitoring

The following process monitoring instrumentation for both Unit 1 and Unit 2 is available at the Train A Hot Shutdown Panel as well as in the Control Room:

- Source Range Monitor
- RCS Loop Pressure (1 channel per each loop) (equivalent to pressurizer pressure plus static head correction)
- RCS Hot Leg Temperature (1 channel per each loop)
- RCS Cold Leg Temperature (1 channel per each loop)
- SG Level (1 channel each)
- SG Pressure (1 channel each)
- Pressurizer Level (also available locally outside charging pump rooms)

Local flow indicators are available in the AFW pump rooms to verify AFW flow. Feedwater flow to the 11 and 12 SGs may also be verified using local flow indicators in the auxiliary building near the Component Cooling Heat Exchangers.

As described in Paragraph 3.c, suction for the AFW pumps may have to be realigned from the CSTs to the Cooling Water System prior to depletion of the CST volume. The lack of direct indication of CST level at either the A Train Hot Shutdown Panel or locally at the tanks, or adequate assurance of procedures to verify CST level is considered an open item (282/87004-01; 306/87004-01) pending further evaluation by the licensee and review of that evaluation by the NRC.

Local indication of RWST level is available at the tanks. Emergency DG fuel oil day tank level indication is provided locally on the Engine Generator Panel along with diesel operating instrumentation and generator voltage and frequency indication.

e. Support Systems

The safe shutdown components and systems described in Paragraph 3.a through 3.d require the operation of several critical support systems to properly perform their safe shutdown function. The following systems must have one train operating to support safe shutdown:

- Component Cooling Water (CCW) System
- Cooling Water System
- Emergency DGs
- Emergency (Safeguards) AC Power Distribution System
- Uninterruptible Instrument and Control DC Power System
- Station and Instrument Air System
- Emergency Lighting System (entire system)

f. Cold Shutdown

The RCS temperature and pressure will be reduced by natural circulation cooldown using the SG PORV and the AFW system as described previously. Once the RCS temperature and pressure have dropped to 350°F and 400 psig, respectively, the Residual Heat Removal (RHR) System is used to establish long term cooling. The decay heat is transferred away by the CCW System via the RHR heat exchangers.

For each Generating Unit, two RHR divisions are provided. Each division consists of suction piping to remove water from the RCS, a RHR pump, discharge piping to an RHR heat exchanger, and return piping to the RCS. Each division is separately powered from its own safeguards power division. Crossover piping with manual valves is provided to allow either pump to operate with either heat exchanger.

4. Alternate Shutdown

The licensee performed a safe shutdown evaluation and associated fire hazards analysis for all ninety four (94) of the identified fire areas. The licensee's analysis has found that in the majority of the fire areas, the separation requirements of 10 CFR 50, Appendix R were found to already exist indicating a high degree of safe shutdown divisional separation in the original design of the plant. Eleven (11) fire areas were found not to meet the requirements of Appendix R, but later qualified for exemptions based on the results of fire hazards analyses and/or plant modifications.

In the event of a fire in the Control Room (Fire Area 13) and/or the Relay and Cable Spreading Room (Fire Area 18) which results in a functional loss of Control Room instrumentation and controls or requires evacuation of the control room, the licensee will use the Train A Hot Shutdown Panel and local operation of required equipment to achieve and maintain hot shutdown. The Train A Hot Shutdown Panel is located in Fire Area 31, the Instrument Air Room and AFW Pump Room, on elevation 695' of the Turbine Building. Cold shutdown from outside of the Control Room may be accomplished by using the Train A Hot Shutdown Panel and local operation of the required pumps and valves.

It should be noted that Unit 1 and Unit 2 share a common control room. The controls associated with each unit are mirrored on opposite ends of the room. Once the decision to evacuate the Control Room has been made, the licensee procedure directs a manual trip of both the Unit 1 and 2 reactors and complete evacuation of both shift crews. Remote shutdown of both units will then take place from the Train A Hot Shutdown Panel, even though only one unit may have suffered damage to its control room controls.

By letter dated December 6, 1982, the licensee requested an exemption from the requirements of Section III.G.3.b to the extent that it requires the installation of a fixed fire suppression system in the control room. In support of this request the licensee noted that certain fire protection features were in place along with permanent manning of the control room area. By letter dated February 2, 1983, the NRC granted this exemption request based on the information provided by the licensee.

On March 2 and 3, 1987, an inspector verified that the fire protection features included an installed ionization-type smoke detection system, portable fire extinguishers, and a fire hose station standpipe system located outside the control room. In addition, on several occasions, the inspectors were in the control room and observed this area to be continuously manned with access controlled.

5. Procedural Review

a. Control Room Evacuation (Fire)-Safe Shutdown Procedure F5 Appendix B

In the event of a fire in the control room and/or relay and cable spreading room, which results in evacuation from the control room, the licensee may shutdown both units from outside the control room in accordance with the F5 Appendix B procedure.

The control room personnel complement consists of a Shift Supervisor, a Lead Plant Equipment and Reactor Operator (LPERO) and a Plant Equipment and Reactor Operator (PE&RO) for each unit, for a total of six individuals. The Unit 1 Shift Supervisor assumes command and control upon entry into the procedure. The Unit 2 Shift Supervisor serves as fire brigade chief (leader) initially and then as Emergency Director until the Technical Support Center is activated. However, the licensee is still required to maintain a five person fire brigade at all times in accordance with licensee commitments. The LPEROs and

PE&ROs from both units and the Auxiliary Building Assistant Plant Equipment Operator together with the Unit 1 Shift Supervisor are required to implement the F5 Appendix B procedure.

Once the decision to evacuate the Control Room is made, Unit 1 and 2 reactors are manually tripped driving the control rods in for initial reactivity control. The remainder of the shutdown will be implemented and directed from the Train A Hot Shutdown Panel, as described in Paragraph 3.a through 3.f in accordance with the F5 Appendix B Procedure.

The Train A Hot Shutdown Panel is located in the West Instrument Air and AFW Pump Room on elevation 695' of the Turbine Building (Fire Area 32). Train A controls are activated at the Hot Shutdown panel by placing all transfer switches in the LOCAL position, including the SG relief valves (CV-31084 and CV-31102) mounted on the right side of the Hot Shutdown Panel. The indicators and controls available at the Train A Hot Shutdown Panel for Unit 1 and 2 shutdown are listed in Appendix B. The Train B Hot Shutdown Panel, located in the adjacent East Instrument Air and AFW pump room, is functionally equivalent to the Train A Hot Shutdown Panel but is not subjected to the requirements of 10 CFR 50, Appendix R as it is not required. Therefore, no credit is taken for the Train B Hot Shutdown Panel in post fire safe shutdown.

b. Control Room Circulation (Fire) D1 Diesel Generator Operation F5 Appendix C

This procedure is planned to be performed in parallel with the F5 Appendix B procedure as required by the situation. The Unit 1 PE&RO is dispatched to the D1 Diesel Room in accordance with the F5 Appendix B procedure. Depending on the condition the operator finds (diesel running/not running, loaded/not loaded, safeguards power available/not available), the operator will perform the applicable procedure sections required to assure that the diesel is running and properly loaded to support the post fire safe shutdown.

c. Procedure Walkdown

The procedure, F5, Appendix B, Revision 3, walkdown was initiated at 0920 hours on March 5, 1987, using five people from the licensee's operating staff with the proper job qualifications to fulfill the Control Room staff positions (the Unit 2 Shift Supervisor was not represented in the walkdown since he was not essential to this procedure). Since the procedure is symptom oriented, the following initial conditions were given:

- Fire in Control Room of sufficient size to require evacuation
- Coincident loss of offsite power
- Both Units 1 and 2 at 100% power

- Safeguards Diesels not running
- Core at mid-life
- Sound powered phones and gai-tronics not available

One inspector accompanied the Unit 1 Shift Supervisor and LPERO to the Train A Hot Shutdown Panel and remained there to observe operator actions, crew direction and leadership, communications, and training and familiarity with the procedure. The inspector also made choices simulating spurious operation and equipment unavailability as appropriate throughout the exercise. The second inspector accompanied the Unit 1 PE&RO to the D1 Diesel Room to observe lighting at local panels and work stations as well as along the routes to these points, local starting and operation of the D1 Diesel, communications, local operation of circuit breakers, and operator training and familiarity with the procedures.

The procedure was halted at step 4.7 which demonstrated that a stable hot shutdown condition had been achieved and a controlled rate of cooldown was to be commenced. AFW flow to the 11 and 21 SGs had been established and verified within 20 minutes of the start of the event. D1 Diesel start took place within 30 minutes of the start of the event. The operators demonstrated adequate training and familiarity with the procedure throughout the walkdown.

The following deficiencies were identified during the procedure review and walkdown:

- In addition to the manual trip of both reactors, MSIVs and pressurizer PORVs on both units are manually secured prior to control room evacuation. The procedure does not direct the operators as to how the MSIVs and pressurizer PORVs may be closed from outside the control room. The reactors may also be tripped by tripping the turbine from the front standard or tripping RPS breakers in the Unit Rod Drive Room, however, this is not directly addressed in the procedures. This is considered an open item (282/87004-02; 306/87004-02) pending evaluation by the licensee and review of that evaluation by the NRC.
- Portable radio communication difficulties were observed. See Paragraph 7 of the report for details.
- Emergency lighting appeared to be inadequate to support the F5 Appendix B and C procedures as performed during the walkdown. See Paragraph 8 of the report for details.
- The procedure directs the operator to trip all air compressors to fail all air operated components to the loss of air position (safe position). The inspector requested the licensee to revise this procedure to show positive verification that the letdown

lines and excess letdown lines have been secured. This is considered an open item (282/87004-03; 306/87004-03) pending evaluation by the licensee and review of that evaluation by the NRC.

The licensee provided an analysis to support the SG performance during the natural circulation cooldown. The pressurizer heaters and PORVs will not be used at all during this process, and no reliance on this equipment is taken for post fire safe shutdown from outside the control room. The licensee was requested by the inspectors to perform an analysis of pressurizer level and pressure versus time for the proposed natural circulation cooldown. The results and information provided by such an analysis, if incorporated into the procedure would provide useful guidance to an operator performing a natural circulation cooldown from the Train A Hot Shutdown Panel, given the instrumentation and controls available. This is considered an open item (282/87004-04; 306/87004-04) pending licensee evaluation and review of that evaluation by the NRC.

d. Preventative Maintenance and Technical Specification Surveillance Procedure

Surveillance test procedures covering the preventative maintenance and TS surveillance requirements for various safe shutdown components and systems were reviewed. These included the SI Pumps, Turbine Driven and Motor Driven AFW Pumps, CCW System, and Charging Pumps. The last two performances of PM3133-1-12, Revision 0, 12 MDAFW Pump Refueling Inspection (a preventative maintenance surveillance), and SP 1102, Revision 26, 11 Turbine-Driven AFW Pump Test (a monthly TS surveillance) were reviewed for inspection of test results. This review showed the procedures to be adequate and the performances reviewed were performed on time and documented adequately.

e. Operator Training on Safe Shutdown Procedures

In addition to observing the operators' performance during the walkdown of the safe shutdown procedure, the Senior Technical Instructor was interviewed concerning operator training on Appendix R post fire safe shutdown procedures. Training records were provided to document operator training for the F5 Appendix A, B, and C procedures which occurred during the year 1986. The inspectors concluded that adequate operator training on the safe shutdown procedures is being conducted.

6. Protection for Associated Circuits

Section III.G of Appendix R requires that protection be provided for associated circuits that could prevent operation or cause maloperation of redundant trains of systems necessary for safe shutdown. The circuits of concern are generally associated with safe shutdown circuits in one of three ways:

- Common Bus Concern

- Spurious Signals Concern
- Common Enclosure Concern

a. Common Bus Concern

The Common Bus concern arises when circuits, either safety related or non-safety related are supplied by a common power source with shutdown equipment and the power source is not electrically protected from the circuit of concern.

The Common Bus concern consists of two items:

- Circuit Breaker/Fuse Coordination
- High Impedance Faults

(1) Circuit Breaker/Fuse Coordination

Circuit coordination is audited by reviewing the time-current characteristic curves developed during the licensee's bus coordination study. During the inspectors review, circuits were selected on a sample basis and their corresponding time-current characteristic curves were examined for proper coordination.

The following circuits were those reviewed during this inspection visit:

Circuit Selected	Results
MCC 1A BUS 1	Unsatisfactory Coordination
MCC 1A BUS 2	Unsatisfactory Coordination
MCC 1K BUS 2	Coordination Satisfactory
MCC 1K BUS 1	Unsatisfactory Coordination
MCC 1KA BUS 2	Coordination Satisfactory
MCC 1AC BUS 1	Unsatisfactory Coordination
MCC 2K BUS 1	Unsatisfactory Coordination
MCC 2A BUS 1	Unsatisfactory Coordination
416KV BUS 15	Coordination Satisfactory
125VDC PNL 11	Coordination Satisfactory
125VDC PNL 12	Coordination Satisfactory

Based on the above inspector findings, the lack of breaker coordination is considered a violation (282/87004-05; 306/87004-05) of Sections III.G.2 and III.L.7 of Appendix R and of 10 CFR 50.48(c) in that the granted schedular exemption implementation date had passed. As a result of the unsatisfactory breaker coordination deficiencies, the licensee, after discussions with the inspectors, implemented fire watch patrols in Fire Areas 31, 32, 58, 59, 60, 73, 74, and 75 since these were the areas of the plant affected by the lack of breaker coordination. The licensee was in the process of completing an analysis to correct the lack of breaker coordination.

During a telephone discussion on April 10, 1987 between the Superintendent, Technical Engineering and the Inspection Team Lead inspector, it was learned that all required circuit modifications for Unit 1 are planned to be completed by May 31, 1987 and for Unit 2 by February, 1988 (certain modifications having to be performed during plant shutdown as a result of safety concerns). The licensee was informed to notify the NRC if the above time schedules change beyond the above dates.

(2) Administrative Controls for Fuse Replacement

The inspectors requested the licensee to develop and implement a procedure to control fuse replacement activities primarily for Appendix R purposes. Such controls would be used to preclude the possibility of improper fuse substitution. This is considered an open item (282/87004-06; 306/87004-06) pending implementation of an approved procedure.

According to licensee management at the exit interview of March 6, 1987, administrative controls are planned to be in place by June 30, 1987.

(3) High Impedance Faults

A review of the licensee's high impedance fault analysis identified the possibility of the loss of the 100 amp source fuse to DC panel 16 (located in Fire Area 18), due to the occurrence of high impedance faults as a result of a fire in the Auxiliary Building Mezzanine Level, Unit 1, on elevation 715 (Fire Area 59). The analysis determined that the safe shutdown load, DG D2 relay panel, is presently supplied from DC panel 16 located in Fire Area 18 and as a consequence would also be lost. The licensee is currently investigating alternative sources of power for the DG D2 Relay Panel to preclude this possibility.

According to the licensee's staff, the high impedance fault concern was a new issue since the licensee's Appendix R commitment dates were established and weren't learned of until Generic Letter 86-10 (April 1986) was reviewed.

This is considered an unresolved item (282/87004-07; 306/87004-07) pending further NRC review.

According to licensee management at the exit interview of March 6, 1987, all required modifications are planned to be completed by August 30, 1987.

b. Spurious Signals

The Spurious Signals concern is made up of two items:

- The false motor, control, and instrument readings such as those encountered at the 1975 Browns Ferry Fire. These could be caused by fire induced ground shorts, or open circuits.
- Spurious operation of safety related or non-safety related components that would adversely affect safe shutdown capability.

(1) High/Low Pressure Interfaces

The following high/low pressure interfaces and their corresponding method of control have been identified by the licensee:

INTERFACE	METHOD OF CONTROL
For Unit 1:	
MV-32164 - RHR suction	(Valves to be maintained
MV-32230 - RHR suction	closed with breakers open
MV-32066 - RHR discharge	as detailed in Procedure No. C-15)
For Unit 2:	
MV-32191 - RHR suction	(Valves to be maintained
MV-32232 - RHR suction	closed with breakers open
MV-32169 - RHR discharge	as detailed in Procedure No. C-15)

The licensee's method of control for the above listed valves was found to be acceptable.

During the inspection, however, it was determined that the licensee's analysis requires further clarification to address control of the following interfaces:

- Pressurizer PORVs
- Normal letdown
- Excess letdown

The licensee's present method of control for these interfaces is by procedural actions prior to evacuation of the control room. Unless alternative actions from outside the control room are specified in the procedure, however, the only action normally given credit for prior to control room evacuation is a reactor trip.

In response to this concern, the licensee initiated a revision to the control room evacuation safe shutdown procedure, F5, Appendix B,to secure pressurizer PORVs, and normal and excess letdown lines from outside the control room.

This is considered an open item (282/87004-08; 306/87004-08) pending final review and approval of the licensee's proposed procedural changes.

According to licensee management at the exit interview of March 6, 1987, this procedural revision is scheduled to be implemented by April 30, 1987.

(2) Current Transformer Open Circuit Secondaries

During the inspectors review, it was determined that the licensee had not prepared an analysis of this concern, however, the licensee's staff contended no specific transmittals between the NRC and the licensee identifying current transformer open circuit secondary details had occurred. The inspectors acknowledged the licensee's contention. This is considered an unresolved item (282/87004-09; 306/87004-09) pending further NRC review.

According to licensee management at the exit interview of March 6, 1987, a technical position would be developed regarding this issue by April 30, 1987.

(3) Isolation of Fire Instigated Spurious Signals

The licensee has provided isolation of fire instigated spurious signals by various methods including isolation switches, dedicated instrumentation, providing one hour protective fire wrap on cables, and administrative controls. The concerns being addressed in this area of associated circuits was emphasized in Information Notice No. 85-09 entitled, "Isolation Transfer Switches and Post Fire Shutdown Capability," dated January 31, 1985.

During a review of the remote transfer switch isolation circuitry for the D1 DG and Hot Shutdown Panels A and B, it was identified that the isolation switches, presently installed at Prairie Island, do not provide redundant fusing of 125 VDC control power. This lack of redundant fusing may result in a loss of 125 VDC control power at the panels in the event of a control room fire. Such an occurrence would require

troubleshooting and may need to be repaired in the form of fuse replacement to achieve hot shutdown. This is considered a violation (282/87004-10; 306/87004-10) of Sections III.G.2 and III.L.7 of Appendix R and of 10 CFR 50.48(c) in that the granted schedular exemption implementation date had passed. The licensee has initiated Modification Number 86 L 927 which the licensee indicated is presently in the construction phase to provide redundant fusing at all isolation transfer switch locations and have implemented compensatory measures (fire watch patrols) until these modifications are completed.

According to licensee management at the exit interview of March 6, 1987, all modifications are planned to be completed by May 1, 1987.

c. Common Enclosure

The common enclosure associated circuit concern is found when redundant circuits are routed together in a raceway or enclosure and they are not electrically protected or fire can destroy both circuits due to inadequate fire barrier penetrations.

This concern was found to be adequately addressed when a sample of circuits were examined and found to be electrically protected. In addition, according to licensee representatives non-safety related cables were never routed from one division to another and cables for redundant safe shutdown divisions are never routed within a common enclosure. A physical in-plant inspection did not identify any exceptions to these statements.

The licensee's protection for the common enclosure associated circuit concern was found to be satisfactory.

(1) Cable Routing

A sample of cables important to safe shutdown were selected and reviewed for compliance with the separation requirements of Section III.G of Appendix R.

The following cables were selected for review:

Component	Cable No.	Function
INV-17	1AC1-9	Power
INV-18	1AC2-8	Power
12 AFW PUMP	16401-1	Power
11 AFW PUMP	1CA116	Control
CCW PUMP 11	15405-1	Power

CCW PUMP 12	16403-1	Power
SG LVL	1CX-125	Instrument
SG LVL	1CR-128	Instrument
INSTRUMENT PWR	1C-5246	HOT SHUTDOWN PNL B PWR
INSTRUMENT PWR	1CX-140	HOT SHUTDOWN PNL A PWR

The cabling listed above was found to be in compliance with Section III.G.

The licensee's control of cables was found to be satisfactory.

7. Communications

The portable radio system is the designated means of communication during alternate shutdown operations. During a walkdown of the licensee's control room evacuation procedure it was observed that the reactor operator stationed at the Emergency DG D1, had difficulty establishing communications with the Shift Supervisor stationed at the Hot Shutdown Panel. Verification of procedural steps involved in starting the DG were relayed to the Shift Supervisor via another operator stationed in a another area of the plant. Confusion appeared to exist as to which of two possible channels would be used at various plant locations.

In addition, other portable radio communication difficulties were observed during the procedure walkdown including: (1) Crosstalk and interference from other outside radio transmissions hampered use of the radios, and (2) radios did not appear capable of transmission between plant locations as required. The above radio difficulties are considered an open item (282/87004-11; 306/87004-11) pending corrective actions by the licensee regarding the above communication system difficulties.

8. Emergency Lighting

During this inspection visit a review of Section III.J of Appendix R was performed which requires that emergency lighting units with at least an eight hour battery power shall be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto. This review included the following: (1) an eight hour discharge test on two emergency lighting units to determine the units operability in their installed condition; (2) a review of the adequacy of two emergency lighting unit surveillance procedures (SP) and comparison of these procedures to the guidelines of the emergency lighting unit manufacturer literature; and (3) a visual inspection during plant tours of the adequacy of the installed emergency lighting units.

a. Eight Hour Discharge Test

On March 3, 1987, at the request of the inspectors, a full discharge test was performed on two emergency lighting units to determine the operability of the units in their installed condition. The following two lighting units were chosen during the inspectors plant familiarization tour on March 2, 1987:

(1) Light No. 1, located in the control room, Unit 2 side. This unit, having two lamps attached, was tested in its installed location. The unit continued to light after eight hours.

(2) Light No. 2, located in the B Train Hot Shutdown Panel area, Unit 1. This unit, having two lamps attached was also tested in its installed location. The unit continued to light after eight hours.

b. Procedural Review

The review of the emergency lighting units SP's included examination of SP 1205, Revision 2, dated April 19, 1984, "Semi-Annual Test" and SP 1708, Revision 1, dated February 26, 1987, "Eighteen Month Eight Hour Test". In addition, these SP's were compared against the emergency lighting unit manufacturer (Teledyne Big Beam) guidelines. The inspectors review of the SP's determined the procedures to be sufficient to maintain the lighting units in an operable condition. Certain minor differences did exist regarding the specific lighting (battery) unit manufacturer maintenance guidelines, however, a licensee staff member initiated a "Submittal Process For Procedures/ Checklists" change request form numbered 5AWI 1.52 to better reflect the lighting unit manufacturer guidelines.

c. Adequacy of Installed Emergency Lighting

Section 50.48(c)(2) requires that the installation of emergency lighting be completed by November 17, 1981, this date being nine months from the effective date of the rule (February 17, 1981). In licensee letters to the NRC dated May 20 and August 23, 1982, Northern States Power Company requested additional schedular relief from 10 CFR 50.48(c) in regard to the installation of emergency lighting at Prairie Island, Unit Nos. 1 and 2 as required by Section III.J of Appendix R. Specifically the licensee requested that the deadline for implementation of the Section III.J requirement for both Units be extended to January 1, 1983 so that the engineering analysis, procurement, and installation of the lighting units could be completed. By letter dated December 8, 1982, the NRC granted this schedular exemption request. However, during a walkdown of the licensee's control room evacuation procedure, F5, Appendix B, on March 5, 1987, the route traversed by the Unit 1 PE & RO was checked for emergency lighting. Since this operator would be responsible for isolating, starting, and loading of the emergency DG requiring several manual actions as well as the verification of instrument readings, the adequacy of the emergency lighting to accomplish these tasks was also checked.

(1) Two areas of the plant used by the Unit 1 PE&RO during the procedural walkthrough did not have installed emergency lighting as follows:

(a) The stairwell from the control room (Fire Area 13, elevation 735') to the D1 DG Room (Fire Area 25, elevation 695') traversed by the Unit 1 PE&RO during the procedural walkdown.

(b) Turbine Building Operator Shack (Fire Area 27, elevation 695'); this area is used to store several volumes of operating procedures which may be needed to be referenced by an operator during an emergency and which were used during the procedure walkdown.

This is considered a violation (282/87004-12; 306/87004-12) of Section III.J of Appendix R and of 10 CFR 50.48(c) in that the granted schedular exemption implementation date had passed.

Based on discussions between the Superintendent, Technical Engineering and the Inspection Team Lead inspector compensatory measures are in place until the necessary corrective actions are completed.

(2) In one additional area of the plant, emergency lighting appeared to be inadequate for the Unit 1 PE&RO to perform the procedural steps safely and efficiently. This area is as follows:

(a) Unit 1 DG Room (Fire Area 25, elevation 695').

This is considered an unresolved item (282/87004-13; 306/87004-13) pending further evaluation by the licensee of this area and, as required by Section III.J, other areas.

9. Oil Collection System For The Reactor Coolant Pumps

During this inspection visit a review of Section III.O of Appendix R was performed regarding the oil collection system(s) for the reactor coolant pumps. Section III.O requires that the reactor coolant pump shall be equipped with an oil collection system if the containment is not inerted during normal operation. In addition, the oil collection system shall be so designed, engineered, and installed that failure will not lead to fire during normal or design basis accident conditions and that there is reasonable assurance that the system will withstand the Safe Shutdown Earthquake. Further, it is required that the collection systems be capable of collecting lube oil from all potential pressurized and unpressurized leakage sites in the reactor coolant pump lube oil systems. Leakage shall be collected and drained to a vented closed container that can hold the entire lube oil system inventory.

By licensee letters dated January 23, 1984, April 5, 1984, and May 22, 1984, the licensee originally provided information concerning the oil collection system and subsequently requested an exemption from

Section III.O of Appendix R to the extent that the reactor coolant pump lube oil collection system is piped to the sump inside containment before it is pumped to a vented container. By letter dated July 31, 1984, NRR granted an exemption to Section III.O of Appendix R, thereby allowing the lube oil leakage to be collected in the sump before it is pumped to a vented container. The licensee's description of the installed lube oil collection system included the following as justification for the exemption to be granted:

- Each reactor coolant pump contains Mobil Synthetic Lube Oil having a flash point of 480°F and an ignition (fire) point of 520°F. Units 1 and 2 each have two reactor coolant pumps.

- A series of drip pans and deflectors are located around the pump such that leakage from all potential and unpressurized leakage sites in the reactor coolant pump lube oil systems are collected and piped to the adjacent floor drain which empties into Sump A in the basement of containment.

- There is no safe shutdown equipment in the area surrounding the reactor coolant pumps or Sump A.

- Sump A is a concrete pit, built into the floor which has a capacity of 990 gallons.

- Sump A is designed to automatically pump down when the level of the tank reaches the 695'9" elevation.

- If level continued to rise due to failure of the automatic pump function, an alarm would sound in the control room.

During the inspectors review, certain of the above described justification points were verified as follows: (1) an in-plant examination of a portion of the installed Unit 1 containment piping and collection system components; (2) a review of Drawing Nos. NF-39248, Revision BD, dated March 10, 1986; NF-39249, Revision AF, August, 1986; and NF-39210, Revision F, dated October 27, 1972; (3) sump capacity calculations and "Tank Book" detail information; (4) lube oil manufacturer specification literature; and (5) related technical discussions with licensee personnel knowledgeable in the collection system design and installation.

Within those areas inspected in Section III.O of Appendix R, the inspectors found those areas to be satisfactory, therefore, it was determined that the Prairie Island oil collection systems are in conformance with Section III. O of Appendix R as approved by NRR.

10. Fire Brigade Drill

By letter dated January 9, 1984, the NRC granted an exemption to certain requirements contained in Section III.G.2 of 10 CFR 50, Appendix R in response to licensee letters dated February 17, and March 11, 1983, as

supplemented by letters dated May 16, and September 2, 1983, for both Prairie Island Units 1 and 2. The areas addressed in the granted exemption regard four plant areas as follows:

(1) Auxiliary Building Ground Floor Level Unit 1 (Fire Area 58);

(2) Auxiliary Building Mezzanine Level Unit 1 (Fire Area 59);

(3) Auxiliary Building Ground Floor Level Unit 2 (Fire Area 73); and

(4) Auxiliary Building Mezzanine Level Unit 2 (Fire Area 74).

As part of the licensee's justification for having the exemption granted, the licensee made reference that the fire brigade would be expected to extinguish a postulated fire before significant damage occurred. In addition, the licensee is required as part of an earlier commitment (Appendix A to the BTP 9.5-1) to have in place a fire brigade staff of five personnel as an element of the Prairie Island Plant fire protection program.

As a result, the inspectors requested the licensee to conduct an unannounced fire brigade drill in Fire Area 58 to observe the firefighting actions taken by the shift personnel during the postulated fire incident; and also, to observe the interface between the fire brigade leader and the radiation protection personnel so as to determine overall fire brigade effectiveness during fire emergency situations involving potential radiation hazards.

On March 5, 1987, at approximately 1700 hours, a licensee staff member activated a fire detector in Fire Area 58 simulating a fire/smoke condition occurring in a motor control center, followed by an airborne radioactivity problem occurring from ruptured contaminated components. The inspector observations during the fire brigade drill including comments made at the post-drill critique and exit interview of March 6, 1987 were as follows:

(1) Assembly of the five fire brigade members was done in a timely and orderly manner. Donning of the fire brigade protective clothing and self-contained breathing apparatus was done at the access control area with the assistance of radiation protection personnel in a satisfactory manner.

(2) Ample staffing of the fire brigade, radiation protection, and security support personnel was observed at the fire scene area.

(3) Sufficient firefighting equipment was brought to the fire scene area and was available for use.

(4) Fire brigade leader and radiation protection personnel worked well together during the fire drill scenario. Certain brigade leader actions were taken after consultation with the on-scene radiation protection personnel.

(5) Adequate personnel safety protection of the plant staff was provided through the use of fire brigade protective clothing, self contained breathing apparatus, radiation monitoring equipment, and use of the time, distance, and shielding methodology.

In summary the overall inspector assessment of the drill concluded, based on inspector observations and post-drill critique discussions, that the performance of shift personnel during the fire drill was satisfactory.

As part of the fire brigade area review, an inspector attended a fire brigade training session on March 4, 1987, at the licensee's training center. The lesson plans were entitled, "Fire Brigade Phase C" Numbered 27623A-001, Revision 2, dated July 12, 1984, and "Firefighting", Revision 9, dated February 18, 1987, which consisted of instruction in certain fire ground command techniques, search and rescue operations, plant specific review of certain firefighting equipment, fire brigade procedure and directive familiarization, fire strategy/pre-plan review of particular plant fire areas, and an overview of licensee firefighting approaches including special considerations necessary during a fire in areas containing radioactive materials.

Based on a review of the above documents, attendance at the fire brigade training session, and discussions with the fire brigade instructor, the inspector concluded that the licensee is meeting NRC requirements in this area.

11. Fire Protection Section Update

In a letter dated September 30, 1976, the NRC requested the licensee to perform a fire hazards analysis report for both Prairie Island Units 1 and 2. By cover letter dated March 11, 1977, the licensee submitted the requested fire hazards analysis report and by letter July 5, 1977, a supplement to the fire hazards analysis report was submitted to the NRC.

During this inspection visit it was learned by the inspectors that as a result of Appendix R modifications, among otners, three revisions (dated April, 1980; December, 1985, and February, 1987) to the fire hazards analysis report have occurred and a fourth is currently in draft form.

The inspectors identified two examples where the as-built plant configuration is not accurately described in Section F5 of the Operations Manual. These examples were as follows:

(1) Fire Area 60 of the Fire Strategies Part to F5 indicates a wet pipe suppression system is planned to be installed in Fire Area 60, however, by letter dated May 4, 1983, the NRC granted an exemption in this area thereby relieving the licensee of having to install a fire suppression system in the area.

(2) Section 5.2.1.2 of the Safe Shutdown Analysis dated June 9, 1986, needs to be revised. This section provides a description of the reactor coolant pump lube oil collection system mentioning that the oil from the containment sump is normally pumped to vented tanks in the auxiliary building having a total capacity of 2600 gallons. During the inspectors review of Section III.O of Appendix R, "Oil Collection System For Reactor Coolant Pumps", the licensee identified an alternate collection point, that being a 25,000 gallon waste hold-up tank which is also a vented closed tank which is currently being used as the final primary collection system. This waste hold-up tank was described in the licensee's original exemption request of April 5, 1984, however, this waste hold-up tank is not described in Section 5.2.1.2 of the Safe Shutdown Analysis.

The licensee was requested by the lead inspector to maintain onsite a current revision of Section F5 of the Operations Manual reflecting the current as-built plant design including those areas noted above.

This is considered an open item (282/87004-14; 306/87004-14) pending NRC review of the updated Section F5.

12. Fire Protection Systems Surveillances

On March 4 and 5, 1987, the inspectors witnessed the following fire protection system surveillance tests performed by the licensee's maintenance, and instrumentation and control (I&C) staffs:

(1) SP 1524, "Diesel Fire Pump Weekly Test"; this surveillance was conducted in accordance with the prescribed procedure having no discrepancies identified by the inspector.

(2) SP 1187A, "Diesel Driven Fire Pump Weekly Battery Inspection"; this surveillance was conducted in accordance with the prescribed procedure having no discrepancies identified by the inspector.

(3) SP 1606, "Monthly Respiratory Protection Check"; this surveillance was conducted in accordance with the prescribed procedure having no discrepancies identified by the inspector.

(4) I&C Periodic Maintenance XO-001, "Fire Detection Calibration Test", of Fire Detection Zones Numbered 43 and 83; these surveillances were conducted and for Zone 43 no discrepancies were identified. For Zone 83 all six fire detectors were out of calibration, five of those six fire detectors were out of calibration to the non-conservative sensitivity range as tested with the use of a voltmeter.

According to the fire strategies portion of Section F5, certain A train diesel cooling water oil transfer pump cabling is routed through Fire Detection Zone 83 (Fire Area 37) which is required for safe shutdown purposes. Based on the importance of the area to safe shutdown and the results of the fire detector calibration test, the inspectors requested the licensee to consider increasing the frequency of the I&C Periodic

Maintenance Test until the results of the test demonstrate calibration of the zone detectors within an acceptable range or more conservative range. This is considered an open item (282/87004-15a; 306/87004-15a) pending licensee review and evaluation of that review by the NRC.

A second concern was raised regarding Fire Detection Zone 83 not being listed in the TS Fire Detection Instrumentation Section, since the A Train Diesel Cooling Water Oil Transfer Pump cabling (which is required for safe shutdown) is routed through this zone. This is considered a second part of open item (282/87004-15b; 306/87004-15b) pending inclusion of this zone into the applicable TS Section. In addition, a review by the licensee is required for other plant areas containing cabling, equipment, or systems necessary for safe shutdown to ensure that they are also included in TSs.

The licensee's staff took opposition to the inspectors position regarding this second part of the above open item on the basis that Fire Detection Zone 83 is not a safeguards area. The inspectors acknowledged the licensee's position, however, following additional NRC internal discussions, the inspectors' position remains as described above.

13. Open Item

Open items are matters which have been discussed with the licensee, which will be reviewed further by the inspector, or which involve some action on the part of the NRC or licensee or both. Open items disclosed during the inspection are discussed in Paragraphs 3, 5, 6, 7, 11, and 12 of the report.

14. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether it is an acceptable item, a violation, a failure to meet a licensee commitment, or a deviation. Unresolved items disclosed during the inspection are discussed in Paragraphs 6 and 8 of the report.

15. Exit Interview

The inspectors met with licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on March 6, 1987, and summarized the scope and findings of the inspection. The lead inspector also discussed the likely informational content of the inspection report with regard to documents reviewed by the inspectors during the inspection. The licensee did not identify any of the documents as proprietary. The licensee was requested by the lead inspector to pursue resolution through NRR of any inspection report item in which the licensee's position differed from that of the inspectors. During the exit interview, the inspectors made mention of certain positive points observed during the inspection visit with respect to the licensee's Fire Protection Program including:
(1) the fire brigade drill was well executed by the licensee's staff
(2) the fire brigade training session attended by the lead inspector

was considered a comprehensive presentation as given by the training instructor, and (3) licensee management was cooperative and responsive to the identified inspector concerns. Additional discussions regarding the inspection findings and the licensee's on-going corrective action schedule were discussed on April 10, 1987, during a telephone call between the Superintendent, Technical Engineering and the Inspection Team Lead inspector.