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Braidwood Generating Station
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November 9, 1995
BW/95-0108

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

To All Concerned:

The enclosed Licensee Event Report from Braidwood Generating Station is being transmitted in accordance with the requirement of 10 CFR 50.73(a)(2)(ii) which requires a 30-day written report.

This report is number 95-013-00, Docket No. 50-456.

Yours truly,

T. J. Tulon
Station Manager
Braidwood Nuclear Station

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Encl: Licensee Event Report
No. 456-95-013-00

cc: NRC Region III Administrator
NRC Resident Inspector
INPO Record Center
ComEd Distribution Center
I.D.N.S.
I.D.N.S. Resident Inspector

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LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT

FACILITY NAME (1) Braidwood Units 1 and 2	DOCKET NUMBER (2) 05000456	PAGE (3) 1 OF 7
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TITLE (4)
Fire Protection Appendix R Design Discrepancies Due to Inadequate Evaluations During Preparation of Original Analysis

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
10	12	95	95	013	00	11	09	95	Braidwood Unit 2	05000457
									FACILITY NAME	DOCKET NUMBER
									Byron Units 1 and 2	05000454/5

OPERATING MODE (9) 6/1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 6: (Check one or more) (11)										
POWER LEVEL (10) 0/99	20.2201(b)			20.2203(a)(2)(v)			50.73(a)(2)(i)			50.73(a)(2)(viii)	
	20.2203(a)(1)			20.2203(a)(3)(i)			X 50.73(a)(2)(ii)			50.73(a)(2)(x)	
	20.2203(a)(2)(i)			20.2203(a)(3)(ii)			50.73(a)(2)(iii)			73.71	
	20.2203(a)(2)(ii)			20.2203(a)(4)			50.73(a)(2)(iv)			OTHER	
	20.2203(a)(2)(iii)			50.36(c)(1)			50.73(a)(2)(v)			Specify in Abstract below or in NRC Form 366A	
20.2203(a)(2)(iv)			50.36(c)(2)			50.73(a)(2)(vii)					

LICENSEE CONTACT FOR THIS LER (12)	
NAME Phil Rausch, Site Engineering x2676	TELEPHONE NUMBER (Include Area Code) (815) 458-2801

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
B				N					

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE.)	X	NO					

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On October 12, 1995, it was determined that the separation requirements of 10CFR 50 Appendix R Section III.G were not met in fire zones 11.6-0 & 11.5-0. A review of the Byron/Braidwood Fire Protection Report (FPR) Safe Shutdown Analysis revealed that analysis conclusions regarding the availability of Unit 1 and 2 Miscellaneous Electrical Equipment Room Ventilation Supply Fans 1VE01C and 2VE01C in Fire Zones 11.6-0 & 11.5-0 may be incorrect. The error was identified as a result of ongoing analyses to resolve Thermo-Lag Fire Barrier issues at Byron/Braidwood Stations.

On October 25, at 0900, it was determined that another fire zone configuration was not in compliance with the separation requirements of 10CFR 50 Appendix R. A review of the FPR revealed that analysis conclusions regarding the availability of Unit 1 Train A Emergency Diesel Generator (EDG) may be incorrect in Fire Zone 11.5-0. This design discrepancy was identified during a review of the open Byron & Braidwood FPR issues discovered during the Thermo-Lag Resolution Project.

On October 25, a review of previous occurrences identified additional design discrepancies which have similar consequences. The discrepancies involve 3 electrical raceways not protected with fire barriers when the FPR Safe Shutdown Analysis concluded (or should have concluded) they should be protected from fire. The equipment potentially impacted by these discrepancies are: 1B Aux Feedwater Pump, 1A Emergency Diesel Generator, and 1A Essential Service Water Pump.

The causes of these events are inadequate evaluations during the preparation of the original Safe Shutdown Analyses and the failure to incorporate Safe Shutdown Analysis requirements into the plant design. Compensatory actions in the form of hourly fire watches have been in place in these zones since plant start up. Design modifications are currently being processed to permanently correct the deficiencies.

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A. PLANT CONDITIONS PRIOR TO EVENTS:

Event Date/Time: October 12, 1995/1425 (CDST);

Unit 1 MODE 6 - Refueling RX Power: 0%; RCS Temperature/Pressure: 75 degrees/0 psi
 Unit 2 MODE 1 - Power Operations RX Power: 99%; RCS Temperature/Pressure: NOT/NOP

B. DESCRIPTION OF EVENTS:

First Identified Discrepancy:

On October 6, 1995, the Engineering Department identified a potential 10CFR 50 Appendix R cable separation deficiency in Fire Zones 11.6-0 and 11.5-0. Specifically, the Braidwood Fire Protection Report (FPR) Safe Shutdown Analysis failed to recognize that both trains of Unit 1 & 2 Miscellaneous Electric Equipment Room (MEER) Supply Fans could be lost due to a fire in these zones.

The existing Braidwood FPR analysis incorrectly states that the Unit 1 Train B MEER Supply Fan (1VE01C) would be available after a fire in zone 11.6-0 and that the Unit 2 Train B MEER Supply Fan (2VE01C) would be available after a fire in zones 11.5-0 and 11.6-0. Neither of the above statements can be justified because the power source (MCC 132X4) for the Unit 1 MEER fan could be unavailable due to a fire in zone 11.6-0. Similarly, the power source (MCC 232X4) for the Unit 2 MEER Supply Fan could be lost due to a fire in either zone 11.5-0 or 11.6-0.

The FPR analysis failed to recognize that (2) 480 Vac ESF Motor Control Centers (MCCs) on each train of both Units are powered from a common source breaker at their respective Unit Substations, see Figure 1. As a result, fire induced failures on one MCC, including its feed cable could trip the common source breaker and render both MCCs unavailable. A review of the affected MCCs concluded that the Train A MCCs did not create any Appendix R separation discrepancies; however, the Train B MCCs did. The FPR analysis assumes that the power source for the Train B MEER Supply Fans (1VE01C & 2VE01C) would be available after a fire in zones 11.5-0 (Unit 2) & 11.6-0 (Units 1 & 2). Since the MCCs supplying electrical power to these fans share common Unit Substation breakers with another MCC which could be damaged due to a fire in zones 11.5-0 (Unit 2) & 11.6-0 (Units 1 & 2) the fans would be unavailable. The Engineering Department concluded that a deficiency existed in the FPR analysis and issued a Problem Identification Form (PIF) on October 9, 1995 to document the discrepancy.

At 1425 on October 12, 1995 it was determined that this condition was reportable per 10CFR 50.72(b)(1)(ii)(B) since the existing configuration was not in compliance with 10CFR 50 Appendix R cable separation requirements. An ENS notification was made at 1450 CDST for a condition outside the design basis of the plant.

Second Identified Discrepancy:

On October 20, 1995, during a review of FPR deficiencies identified during the Thermo-Lag Resolution activities at the Byron and Braidwood Stations, the Engineering Department identified an additional potential 10CFR 50 Appendix R cable separation deficiency in Fire Zone 11.5-0. Specifically, FPR conclusions regarding the availability of Unit 1 Train A Emergency Diesel Generator (EDG) may have been incorrect in Fire Zone 11.5-0.

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The existing FPR analysis failed to recognize that the Potential Transformer (PT) and Current Transformer (CT) cables are required for the proper operation of the EDGs and consequently the routing of the associated cables was not reviewed as part of the Safe Shutdown Analysis. The Engineering Department reviewed the PT & CT cable routing for all four EDGs to evaluate Appendix R separation requirements. The review identified that the 1A EDG PT & CT cables (1DG222 & 1DG223) are located in zone 11.5-0 and are not protected. The review also identified that the 2A EDG PT & CT cables are located in zone 3.2-2; however they are protected in a rated fire barrier. The Engineering Department concluded that a deficiency existed in the Braidwood FPR analysis for fire zone 11.5-0 and issued a PIF on October 24, 1995 to document the discrepancy.

At 0900 on October 25, 1995 it was determined that this condition was reportable per 10CFR 50.72(b)(2)(i) since the existing configuration was not in compliance with 10CFR 50 Appendix R cable separation requirements. AN ENS notification was made at 1209 CDST for a condition outside the design basis of the plant.

Additional Identified Discrepancies:

A review of previously issued PIFs written against the FPR Safe Shutdown Analysis revealed three cases of 10CFR 50 Appendix R cable separation violations. These PIFs were written in 1993-1995 as result of engineering activities to resolve Thermo-Lag (Generic Letter 92-08) issues. At the time these PIFs were screened for reportability, it was determined that they were not reportable. However, Braidwood Station now believes these PIFs are reportable as a condition outside of the plant design basis. The three cases of separation violations are discussed individually below.

- 1) Power cable 1SX001 for the 1A Essential Service Water (SX) pump is not protected with a 3-hour rated fire barrier in Fire Zone 11.3-0, as specified in the FPR Safe Shutdown Analysis. The FPR analysis concludes that the 1A SX pump will be available after a fire in zone 11.3-0 because the pump's power cable is protected in a 3-hour rated fire barrier. However, a portion of this cable, a 6' length of conduit near the ceiling, is unprotected in the zone. Therefore, this cable and consequently the 1A SX pump may not be available after a fire in this zone.
- 2) Control cables 1AF338 and 1AF346 for the 1B Auxiliary Feedwater (AF) pump are not protected with a 3-hour rated fire barrier in Fire Zone 11.6-0, as required to support the Safe Shutdown analysis for that zone. The FPR Analysis did not recognize that these cables are routed in the zone and concluded that the 1B AF Pump will be available after a fire. However, the subject control cables are required for the operation of the pump and they are located in the zone unprotected. Therefore, these cables and consequently the 1B AF pump may not be available after a fire in this zone.
- 3) Control cables 1DG157 and 1DG175 for the 1A EDG are not protected with a 1-hour rated fire barrier in Fire Zone 3.2A-1, as required to support the Safe Shutdown analysis for that zone. The FPR Analysis did not recognize that these cables are routed in the zone and concludes that the 1A EDG is available after a fire in zone 3.2A-1. However, the subject control cables are required for the operation of the EDG and they are located in the zone unprotected. Therefore, these cables and consequently the 1A EDG may not be available after a fire in this zone.

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These cases are reportable per 10CFR 50.73(a)(1) and 50.73 (a)(2)(ii)(B) as a condition outside of the plant design basis; however, ENS notification was not made at the time of discovery. These cases were among several FPR deficiencies identified during the Thermo-Lag resolution activities. They were identified for trending purposes to identify common root causes under Generic Letter 92-08. As further discrepancies were identified, they were also closed out to this Generic Letter. This process resulted in later PIFs not being adequately screened for reportability to the extent that they would have had they not been assigned to the Generic Letter.

Compensatory actions in the form of hourly fire watches have been in place in these fire zones since plant start up. The hourly fire watches will remain in place until the fire barrier discrepancies are permanently resolved.

C. CAUSE OF EVENT:

The cause of the first identified discrepancy was a failure of the original Braidwood FPR Safe Shutdown Analysis to recognize the interconnection between MCCs powered from a single 480 volt Unit Substation breaker. Consequently, the FPR Analysis for Fire Zones 11.5-0 and 11.6-0 did not consider the potential loss of some MCCs located outside of the fire zone. The analysis addressed what equipment and cables are located in the fire zone and could be directly affected by a fire. An assumption was implicitly made and the analysis was performed as if the power and control cables for each component formed an independent circuit and that a failure of cables for one component would not have any impact on any other safe shutdown components. This assumption is based on breaker coordination studies that demonstrate that fire induced faults on a cable will not cause an upstream supply breaker to open before the specific load fuse or breaker for the circuit in question opens. This assumption is not valid for the identified configuration of two MCCs fed from a single Unit Substation breaker. The exception to the breaker coordination assumption is an isolated case in the existing Byron and Braidwood Safe Shutdown Analysis.

The cause of the second identified discrepancy was a failure of the original FPR Safe Shutdown Analysis to recognize that the EDG PT & CT circuits were required for the emergency operation of the EDGs. Consequently, the Safe Shutdown Analysis did not review the routing of the associated cables. The CT circuit is required for the operation of the electronic governor and the PT circuit is required for the operation of the electronic governor and automatic voltage regulator. Loss of these circuits could prevent the EDGs from performing their function.

The causes of the additional identified discrepancies can be grouped into the following two categories:

- 1) Failure of the Design Process to incorporate FPR analysis requirements in the appropriate design documentation (case number 1).
The appropriate design documents did not specify that a fire barrier was required. The FPR analysis requirements were not correctly incorporated into the appropriate design drawings.
- 2) FPR Safe Shutdown Analyses design input errors (case numbers 2 & 3).
The original FPR inputs regarding safe shutdown cable routing, were incorrect. The FPR analysis did not identify that the affected cables were located in a particular fire zone and consequently the impact of fire induced failures of these cables in the zone was not evaluated.

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D. SAFETY ANALYSIS:

This LER identifies instances where 10CFR 50 Appendix R requirements to assure at least one train of Safe Shutdown equipment is available to safely shutdown the reactor in the event of a fire are not met. Automatic fire detection systems are installed throughout all affected areas. Hourly fire watches were implemented for the affected fire zones since plant start up. The use of ignition sources and transient combustibles in the affected areas is also strictly controlled by station administrative procedures.

Based on the low combustible loadings and type/configuration of combustibles (i.e. IEEE 383 qualified cable insulation) in these fire zones, any postulated fire would be slow in developing. With the presence of automatic detection systems, hourly fire watches and station administrative controls, a fire with the intensity necessary to damage both trains of Safe Shutdown cables is highly unlikely. Had conditions conducive to a fire existed or had an actual fire occurred in any of the affected fire zones, the automatic detection system or compensatory hourly fire watch would have detected the conditions prior to the fire developing or detected the fire in its incipient stage. It is highly likely that a fire would have been extinguished by the on-site fire brigade before the fire affected both safe shutdown trains. There are active fire suppression systems installed in some of the affected zones. These systems further limit the likelihood of a fire affecting both trains of safe shutdown equipment in those particular zones.

Hourly fire watches will remain in effect for all affected fire zones until all Safe Shutdown discrepancies are permanently rectified.

Due to the fire protection measures discussed above, these events have minimal safety significance.

E. CORRECTIVE ACTION:

- Hourly fire watches will remain in effect for all fire zones until all Safe Shutdown discrepancies are permanently rectified.
- The Station has initiated plant modifications to permanently resolve the deficiencies described herein. The affected MCCs will be re-powered from different source breakers at their respective Unit Substations. The affected DG and SX system cables will be re-routed out of the fire zones. The AF pump circuitry will be re-wired to eliminate the impact of fire induced failures on the affected AF system cables. Installation of the Unit 1 modifications were all completed during the recent re-fueling outage with the exception of one cable in the SX system. Installation of the Unit 2 modifications will begin during the upcoming re-fueling outage. The installation activities for these modifications will be completed by December 1996. This will be tracked to completion by commitment 456-180-95-01301 and -01302 for Units 1 and 2, respectively.
- The Station will assess the condition of the Braidwood Station Units 1 & 2 FPR Safe Shutdown Analysis (Section 2.4). The assessment will review previously identified problems, root causes, and recommended corrective actions. A comprehensive review of the FPR Analysis will be performed and all discrepancies identified will be resolved. This will be tracked to completion by commitment 456-180-95-01303.

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E. CORRECTIVE ACTION (cont.):

4. More conservative criteria for reporting deficiencies in the FPR analysis were established in an October 23, 1995 telephone conference between Braidwood and Byron Station Regulatory Assurance and Engineering Departments. The criteria will be applied to any future event to establish whether it is reportable.

F. RECURRING EVENTS SEARCH AND ANALYSES:

As discussed in DESCRIPTION OF EVENT, previous occurrences at both Byron and Braidwood Stations were researched and are reported as a part of this LER.

G. COMPONENT FAILURE DATA:

None.

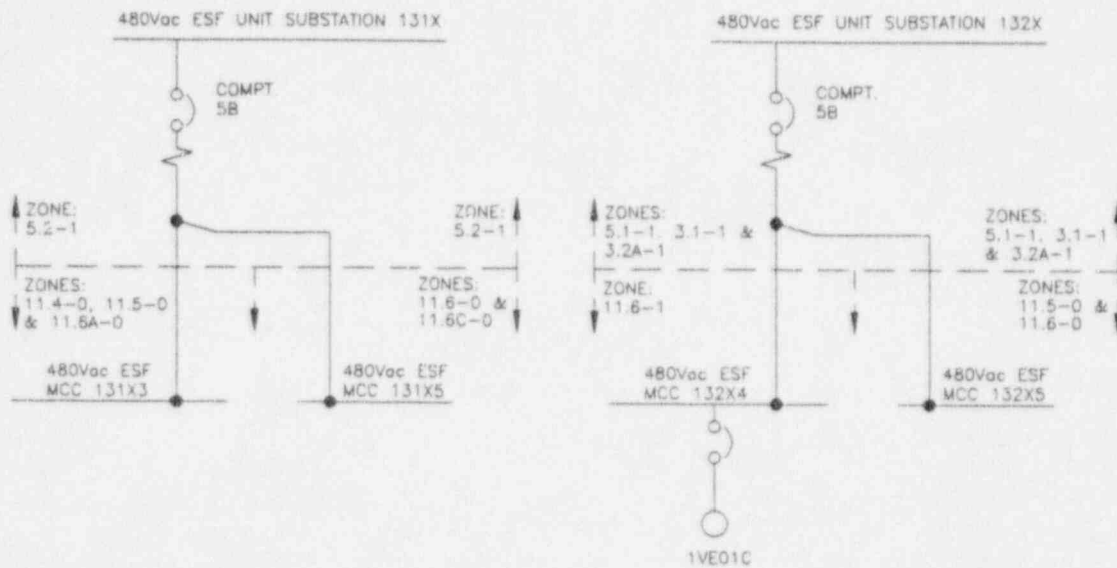
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FIGURE 1 - MCCs WITH COMMON SOURCE BREAKERS

UNIT 1



UNIT 2

