

Commonwealth Edison Company  
Byron Generating Station  
4450 North German Church Road  
Byron, IL 61010-9794  
Tel 815 234-5441



DATE November 7, 1995

LTR: BYRON 95-0358  
FILE: 3.03.0800 (1.10.0101)

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

Dear Sir:

The Enclosed Licensee Event Report from Byron Generating Station is being transmitted to you in accordance with the requirements of 10CFR50.73(a)(2)(ii).

This report is number 95-005; Docket No. 50-454.

Sincerely,

A handwritten signature in dark ink, appearing to read "K. L. Koffron".

K. L. Koffron  
Station Manager  
Byron Nuclear Power Station

KLK/PW/ba

Enclosure: Licensee Event Report No. 95-005

cc: H. J. Miller, NRC Region III Administrator  
NRC Senior Resident Inspector  
INPO Record Center  
CECo Distribution List

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A handwritten signature in dark ink, possibly reading "JE22".

SIGNATURE PAGE FOR LICENSEE EVENT REPORT

LER Number  
454:95-005

Title of Event: Fire Protection Report Discrepancies Due To Inadequate Evaluations During Preparation of Original Analysis

Occurred: 10-10-95 / 1000  
Date Time

Licensee Contact: Don Robinson

OSR DISCIPLINES REQUIRED: ABC

WEG / 11/2/95  
SES DATE

Acceptance by Station Review:

MJH / ABC / 11/5/95  
OE Disciplines Date

WEG / A / 11/2/95  
SES Disciplines Date

W Brink / ABC / 11/3/95  
RAS Disciplines Date

\_\_\_\_ / \_\_\_\_ / \_\_\_\_  
Other Disciplines Date

\_\_\_\_ / \_\_\_\_ / \_\_\_\_  
Other Disciplines Date

Approved by: KC Kofm / 11/8/95  
Station Manager Date

## LICENSEE EVENT REPORT (LER)

(See reverse for required number of

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.

BYRON NUCLEAR POWER STATION

05000454

1 OF 9

## FIRE PROTECTION REPORT DISCREPANCIES DUE TO INADEQUATE EVALUATIONS DURING PREPARATION OF ORIGINAL ANALYSIS

MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
10	10	95	95	005	00	11		95	Braidwood Station	05000456
									Byron Unit 2	05000455
OPERATING MODE (9)			20.2201(b)			20.2203(a)(2)(v)			50.73(a)(2)(i)	50.73(a)(2)(viii)
POWER LEVEL (10)			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)	
NAME									TELEPHONE NUMBER (Include Area Code)	
Don Robinson, SEC, Ext. 2843									815-234-5441	
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
B				N						
YES (If yes, complete EXPECTED SUBMISSION DATE).						NO		EXPECTED SUBMISSION DATE (15)		

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

On October 10, 1995, a review of the Safe Shutdown Analysis in the Fire Protection Report (FPR) revealed that analyses conclusions regarding the availability of Unit 1 and 2 Miscellaneous Electric Equipment Room Ventilation Supply Fans for a fire in Fire Zone 11.6-0 are incorrect. The error was identified as a result of ongoing analyses to resolve Thermo-Lag Fire Barrier issues at Byron and Braidwood Stations.

On October 13, it was determined that another fire zone configuration was not in compliance with 10CFR50, Appendix R. A review of the FPR Safe Shutdown Analysis revealed that analyses conclusions regarding the availability of Unit 1 Division 11 Switchgear Vent Fan and the Division 11 Diesel Generator Fuel Oil Transfer Pump are incorrect in Fire Zone 11.4-0.

On October 26, it was determined previously identified discrepancies were also reportable to the NRC. The discrepancies involve cables not protected with a fire barrier when the Fire Protection Report Safe Shutdown Analysis concluded (or should have concluded) they require protection from fire. The equipment impacted by these discrepancies are: 1B Aux Feedwater Pump, 1B Centrifugal Charging Pump, 1A Emergency Diesel Generator, 2A Emergency Diesel Generator, Valve 1RH8701A, and 1A Essential Service Water Pump.

The causes of these events are inadequate evaluations during the preparation of the original Safe Shutdown Analysis 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 late 1992 due to fire barrier deficiencies. Hourly fire watches existed in these zones prior to 1992 for other reasons. Design modifications are currently being processed to permanently correct the deficiencies.

These occurrences are reportable per 10CFR 50.73(a)(1) and 50.73 (a)(2)(ii)(B).

**LICENSEE EVENT REPORT (LER)**  
**TEXT CONTINUATION**

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

**A. PLANT CONDITIONS PRIOR TO EVENTS:**

Event Date/Time 10-10-95 /1000

Unit 1 MODE 1 - Power Operations RX Power 99.2% RCS NOT/NOP

Unit 2 MODE 1 - Power Operations RX Power 99.8% RCS NOT/NOP

**B. DESCRIPTION OF EVENTS:**

At 1000 hours on 10/09/95, Byron Site Engineering received a telephone call from Braidwood Site Engineering identifying that Fire Zone 11.5-0 and 11.6-0 Fire Protection Report (FPR) Safe Shutdown Analysis were deficient in that they failed to recognize that both trains of Miscellaneous Electric Equipment Room (MEER) Supply Fans could be lost due to a fire in either of these zones. Byron Site Engineering began an evaluation to determine if a similar condition existed at Byron.

At 1000 hours on 10/10/95, Byron Site Engineering concluded that a deficiency similar to Braidwood's deficiency existed for Byron Fire Zone 11.6-0 FPR Safe Shutdown Analysis. A Byron Problem Identification Form (PIF) was written at that time to document the following discrepancy. Byron FPR, Unit 1, Section 2.4.2.51 (Fire Zone 11.6-0 Safe Shutdown Analysis) states that Division 12 fans will be available after a fire in this zone. FPR Section A5.8.22 states that the Division 12 MEER supply fan will be operational after a fire in zone 11.6-0. Neither of the above statements can be justified because the Division 12 MEER Supply Fan (1VE01C) could be lost due to a fire in zone 11.6-0. Similarly, the Unit 2 Division 22 MEER Supply Fan (2VE01C) could be lost due to a fire in zone 11.6-0.

The FPR Safe Shutdown Analysis for Fire Zone 11.6-0 failed to recognize the loss of electric power to the Division 12 and 22 MEER Supply Fans. Although the power cables for these fans are not routed through Fire Zone 11.6-0, they are powered from Motor Control Centers (MCCs) which are affected by a fire in zone 11.6-0. The MCCs supplying power to the Division 12 and 22 MEER Supply Fans are powered from two 480 volt breakers that also power MCCs located in zone 11.6-0. The MCCs located in fire zone 11.6-0 can be damaged by a fire in this zone. A fire induced fault on these MCCs will cause the 480 volt breakers to open which will also de-energize the MEER Supply Fans. See Figure 1 in Attachment A for a diagram of the above configuration.

At 1425 on 10/12/95, it was determined that the existing configuration was not in compliance with 10CFR 50, Appendix R, for Fire Zone 11.6-0 and that this condition was reportable per 10CFR 50.72(b)(1)(ii)(B). An ENS phone notification was made to the NRC at 1510 on 10/12/95 (Event #29449) for a condition outside the design basis for the plant.

A review of all other Byron configurations of multiple MCCs powered from a common 480 volt breaker was conducted. At 1510 on 10/13/95, all configurations were judged to be acceptable for 10CFR 50, Appendix R considerations, except for a deficiency in the FPR Safe Shutdown Analysis for Fire Zone 11.4-0. The original Safe Shutdown Analysis failed to recognize the possible loss of both Diesel Oil Transfer Pumps for the 1A Emergency Diesel Generator and the loss of the Division 11 ESF Switchgear Room Supply Fan in this zone.

(4-95)

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**B. DESCRIPTION OF EVENTS:** (cont.)

Unit 1 FPR Sections 2.4.2.43 and A5.8.17 state that Division 11 equipment is relied upon for a fire in Fire Zone 11.4-0. The power cable for Diesel Oil Transfer Pump (1DO01PA, Division 11) is routed in this zone and can be damaged by a fire. Redundant pump (1DO01PC, Division 11), its power cable, and MCC power source are located outside of zone 11.4-0. The MCC power source receives power from a common 480 volt bus breaker which also powers an MCC located in Fire Zone 11.4-0. The MCC located in zone 11.4-0 can be damaged by a fire in this zone. Therefore, a fire-induced failure on this MCC will cause the common supply breaker to open and de-energize the MCC supplying power to pump 1DO01PC. With both Diesel Oil Transfer pumps not available, the 1A Emergency Diesel Generator is not available. Additionally, the Division 11 ESF Switchgear Room Supply Fan (1VX04C) is powered by the MCC for pump 1DO01PC. Similarly, fan 1VX04C may not be available for a fire in zone 11.4-0. See Figure 2 in Attachment A for a diagram of the above configuration.

At 1530 on 10/13/95, it was determined that the existing configuration was not in compliance with 10CFR 50, Appendix R in Fire Zone 11.4-0 and is reportable per 10CFR 50.72(b)(1)(iii)(B). An update to the ENS phone notification (Event #29449) was made to the NRC at 1604 hours on 10/12/95.

In response to the events, a review of previous occurrences for this type of deficiency identified several PIFs, written in 1993-1995, against the FPR Safe Shutdown Analysis. The identified PIFs were written as a result of reviews to resolve Thermo-Lag (Generic Letter 92-08) issues. The PIFs were also briefly described in a Byron letter (dated 1/13/94) to the NRC addressing Generic Letter 92-08 issues. At the time the PIFs were screened for reportability, it was determined they were not reportable. However at 1455 hours on 10/26/95, Byron Station concluded seven of these PIFs have consequences similar to the events reported on 10/12/95 and 10/13/95 and are, therefore, reportable. A ENS Phone notification (second update to Event #29449) was made to the NRC at 1534 hours on 10/26/95. The seven PIFs are discussed individually below.

- 1). Power cable 1SX001 for the 1A Essential Service Water pump is not protected with a 3-hour fire barrier in Fire Zone 11.3-0, as specified in the FPR Section 2.4.2.37, Safe Shutdown Analysis.
- 2). Control cables 1AF338 and 1AF346 for the 1B Auxiliary Feedwater pump are not protected with a 3-hour fire barrier in Fire Zone 11.6-0, as required to support the analysis for that zone.
- 3). Four Division 11 conduits located in the Division 12 Cable Tunnel (Fire Zone 3.1-1), containing 1A Emergency Diesel Generator Control cables, are not protected with a 1-hour fire barrier, as required to support the analysis for that zone.
- 4). Control cables 2DG222 and 2DG223 for the 2A Emergency Diesel Generator are not protected with a 1-hour fire barrier in Fire Zone 3.1-2, as required to support the analysis for that zone.
- 5). Power cable 1CV011 for the 1B Centrifugal Charging pump is not protected with a 1-hour fire barrier in Fire Zone 11.3-1, as required to support the analysis for that zone.
- 6). Control cable 1RH030 for Motor Operated Valve 1RH8701A is not protected with a 3-hour fire barrier in Fire Zone 11.5-0, as specified in the FPR Section 2.4.3.2.1.3 Safe Shutdown Analysis.

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**B. DESCRIPTION OF EVENTS:** (cont.)

- 7). Control cables 1DG157 and 1DG175 for the 1A Emergency Diesel Generator are not protected with a 1-hour fire barrier in Fire Zone 3.2A-1, as required to support the analysis for that zone.

Compensatory actions in the form of hourly fire watches have been in place in the affected fire zones since late 1992 due to Thermo-Lag fire barrier deficiencies. Hourly fire watches existed in these zones prior to 1992 for other reasons. The hourly fire watches will remain in place until the fire barrier discrepancies are permanently resolved.

These occurrences are reportable per 10CFR 50.73(a)(1) and 50.73 (a)(2)(ii)(B).

**C. CAUSE OF EVENT:**

The cause of the events reported on 10/12/95 and 10/13/95 was a failure of the team of analysts preparing the original Byron Safe Shutdown Analysis to recognize the interconnection between MCCs powered from a single 480 volt Bus breaker. Consequently, the Safe Shutdown Analysis for Fire Zones 11.4-0 and 11.6-0 did not consider the potential loss of some MCCs located outside of the fire zone. The team of analysts considered the equipment and cables located in the fire zone that could be directly affected by a fire. An assumption was implicitly made and the analyses was performed as if the power and control 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 would not apply if two MCCs are fed from a single bus breaker.

The cause of the seven instances of missing Thermo-Lag fire barriers reported on 10/26/95 can be grouped into 3 types of errors.

- 1). Lack of specification of requirement in the FPR Safe Shutdown Analysis (4 occurrences)

In one instance, the safe shutdown cable routing was not correctly specified in the FPR. In the remaining instances, the FPR analysis did not recognize the Safe Shutdown significance of impacted cables. Consequently the cables were not evaluated correctly, nor were protection requirements specified. Because there was no requirement in the FPR, the corresponding design document did not specify a fire barrier and therefore was not installed in the field.

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**C. CAUSE OF EVENT: (cont.)**

- 2). Failure of the Design Process to include FPR requirement in appropriate design documentation (2 occurrences)

In two occurrences, the design drawings for trays did not specify that fire barriers were required. Transferring the initial FPR requirements into the appropriate design drawings was not performed correctly. All of these instances occurred on Unit 1. The design process failures are believed to be isolated instances during completion of construction on Unit 1.

- 3). Fire barrier specified on design document was not installed in the plant (1 occurrence).

In this instance, the FPR evaluation and design drawings specified the requirement, however the appropriate fire barrier was not installed in the field. This instance occurred on Unit 1. The installation process failure is believed to be an isolated instance during completion of construction on Unit 1.

The cause of why the above seven instances were not reported to the NRC at the time they were initially screened, reflects a matter of judgment at the time of screening. All events are some combination of Thermo-Lag fire barrier not installed as specified in the FPR or a failure to specify a fire barrier in the FPR. The first PIFs written were strongly associated with Thermo-Lag resolution activities in progress at the time. They were assigned to a "trending PIF" for identification of root cause believed to be common among all identified events. As further deficiencies were documented, some of which are less strongly tied to Thermo-Lag, they were similarly assigned to the trending PIF. This process resulted in later PIFs not being screened for potential reportability to the extent they would have had they not been assigned to the trending PIF. Closeout of the trending PIF specified root cause and corrective actions for the collective population of PIFs. No further assessments for reportability were performed.

**D. SAFETY ANALYSIS:**

The instances described in this LER are situations where protection was not provided to assure one train of Safe Shutdown equipment is available to safely shutdown the reactor for a postulated fire as required in 10CFR 50 Appendix R. Automatic fire detection systems are installed throughout all affected areas. Hourly fire watches were also present in the affected fire zones back to the initiation of the Fire Watch Program in 1988. The use of ignition sources and transient combustibles in the affected areas is also strictly controlled by station administrative procedures.

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**D. SAFETY ANALYSIS: (cont.)**

Based on the low combustible loadings and type and configuration of combustibles (i.e. IEEE 383 qualified cable insulation) in these fire zones, a slow developing, low heat release rate fire would be expected. With the presence of the automatic detection systems, hourly fire watches and station administrative controls, it is highly unlikely a fire could result with the intensity to damage all cables included in Appendix R Safe Shutdown Analysis. Had conditions conducive to a fire existed or an actual fire occurred in any fire zone, 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. Because of this prompt identification, it is highly likely that the on-site fire brigade would have extinguished the fire before the fire affected both safe shutdown trains. There are also active fire suppression systems installed in some of the affected zones. These systems could have further limited the likelihood of a fire affecting both trains of safe shutdown equipment in those particular zones.

There is no impact on the health and safety of the public as a result of these events.

**E. CORRECTIVE ACTIONS:**

**Short Term Corrective Actions:**

1. A Daily Order was immediately written to identify and define to Operations the deficiencies reported on 10/12/95 and 10/13/95.
2. Hourly fire watches are in effect in all fire zones impacted and will remain so until permanent corrective actions are taken.
3. Darmatt KM1 fire barrier was installed on some of the conduits and trays containing 1A Diesel Generator cables in the spring of 1995. This installation resolves some of the discrepancies identified in 1993.
4. Criteria for reporting deficiencies in the FPR were established in an October 23, 1995, teleconference between Byron and Braidwood Station Regulatory Assurance and Site Engineering Departments. The criteria will be applied to any future events to establish whether it is reportable.

**Long Term Corrective Actions:**

1. Plant modifications have been initiated to permanently correct each deficiency described in this LER. The Unit 1 modifications are expected to be installed by May, 1996, and the Unit 2 modifications are expected to be installed by December, 1996. (NTS # 454180950005-01,02)
2. An action plan to assess the FPR Safe Shutdown Analysis (Section 2.4 of the FPR) is being developed. The plan will review all previously identified problems, determine root cause, and recommend corrective actions in order to confirm the technical integrity of the FPR analysis. Comprehensive reviews of the Byron FPR Safe Shutdown Analysis are being considered to search for and identify any other unknown discrepancies which may exist. (NTS # 454180950005-03)

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F. RECURRING EVENTS SEARCH AND ANALYSES:

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

A search of INPO (SOERs, SERs) and NRC (Generic Letters, Bulletins, Notices) documents resulted in no recommendations applicable to the events in this LER.

G. COMPONENT FAILURE DATA:

None.

# LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

BYRON NUCLEAR POWER STATION

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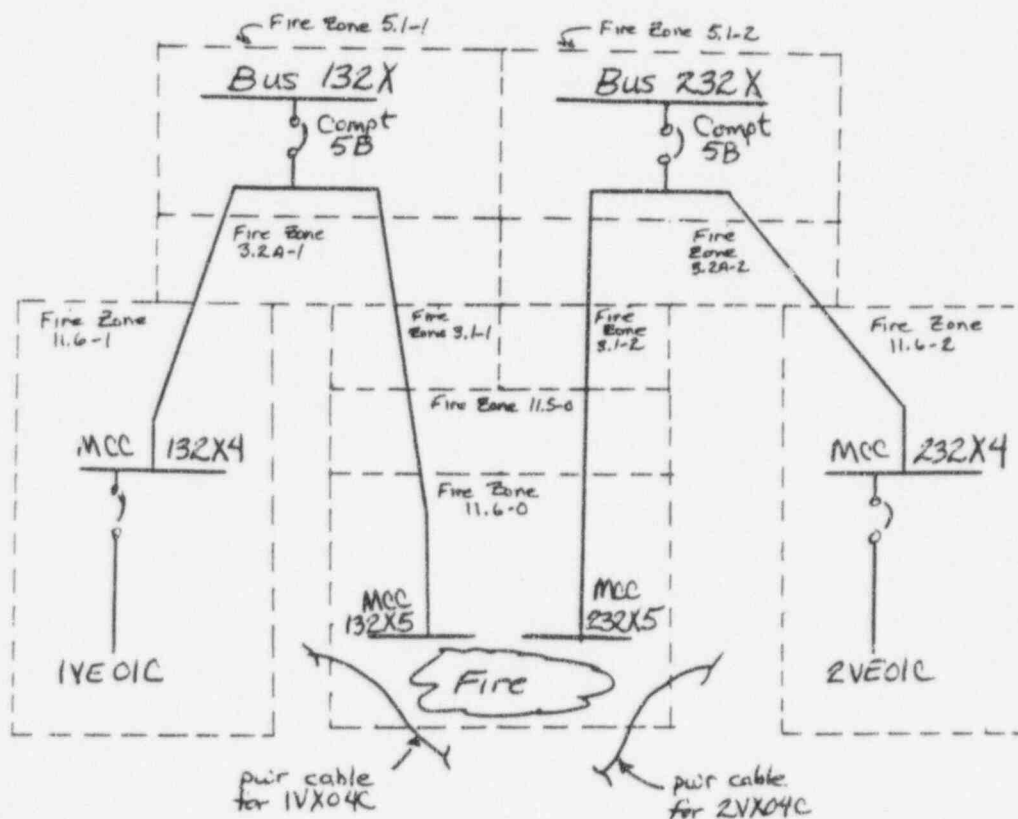
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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

## Attachment A

Figure 1: Configuration of Fire Zone 11.6-0



Problem: Appendix R Fire in Zone 11.6-0 (Elev. 426', AB) may cause failure of:

- 1). Power cable for 1VX04C (U-1 Div 11 MEER Supply Fan)
- 2). Power cable for 2VX04C (U-2 Div 21 MEER Supply Fan)
- 3). Fault MCC 132X5 which causes Bus 132 Compt 5B breaker to open when sensing fault current.

Therefore MCC 132X4 de-energized resulting in:

- (a) Loss of 1VE01C (U-1 Div 12 MEER Supply Fan)
- 4). Fault MCC 232X5 which causes Bus 232 Compt 5B Breaker to open when sensing fault current.

Therefore MCC 232X4 de-energized resulting in:

- (a) Loss of 2VE01C (U-2 Div 22 MEER Supply Fan)

Which means for a fire in Zone 11.6-0;

Both redundant MEER Supply Fans are lost on both units.

**LICENSEE EVENT REPORT (LER)**  
**TEXT CONTINUATION**

BYRON NUCLEAR POWER STATION

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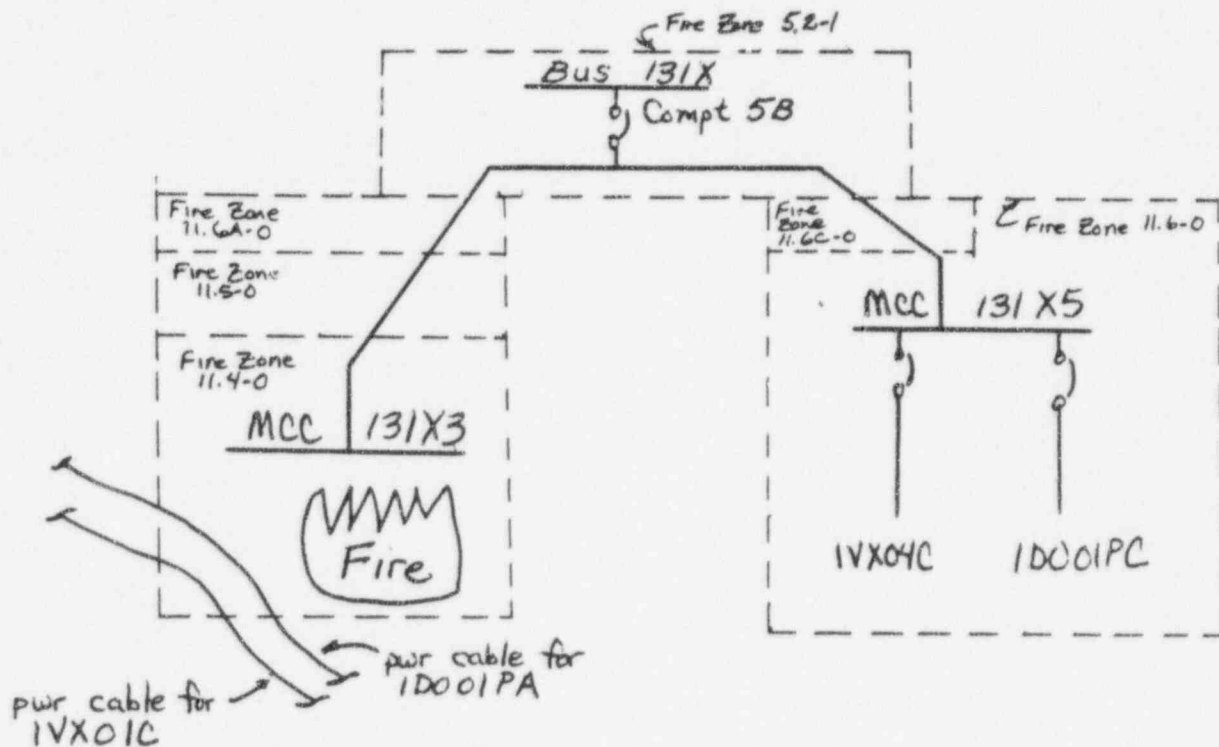
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## Attachment A

Figure 2: Configuration of Fire Zone 11.4-0



Problem: Appendix R Fire in Zone 11.4-0 (Elev. 383', AB) may cause failure of:

- 1). Pwr cable for 1VX01C (Div 12 ESF Swgr Supply Fan)
- 2). Pwr cable for 1DO01PA (A Diesel Oil pp for 1A D/G)
- 3). Fault MCC 131X3 which causes Bus 131 Compt 5B breaker to open when sensing fault current.

Therefore MCC 131X5 de-energized resulting in:

- (a) Loss of 1VX04C (Div 11 ESF Swgr Supply Fan)
- (b) Loss of 1DO01PC (A Diesel Oil pump for 1A D/G)

Which means for a fire in Zone 11.4-0, which the FPR Safe Shutdown Analysis states that Division 11 will be protected from fire:

- 1). Both DO pumps for the 1A D/G are lost
- 2). Div 11 ESF Swgr Room Supply Fan 1VX04C is lost