



Commonwealth Edison
Byron Nuclear Station
4450 North German Church Road
Byron, Illinois 61010

November 14, 1990

Ltr: BYRON 90-0973

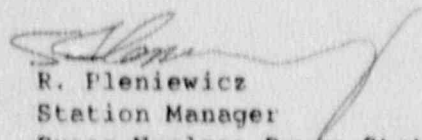
U. S. Nuclear Regulatory Commission
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Dear Sir:

The enclosed Licensee Event Report from Byron Generating Station is being transmitted to you as a Supplemental Report.

This report is number 90-010-01;; Docket No. 50-454.

Sincerely,


R. Pleniewicz
Station Manager
Byron Nuclear Power Station

RP/mlm

Enclosure: Licensee Event Report No. 90-010-01

cc: A. Bert Davis, NRC Region III Administrator
W. Kropp, NRC Senior Resident Inspector
INPO Record Center
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LICENSEE EVENT REPORT (LER)

Form Rev 2.0

Facility Name (1) Byron, Unit 1 Docket Number (2) 0 5 | 0 | 0 | 0 | 4 | 5 | 4 Page (3) 1 | of | 0 | 4
 Title (4) 1A Auxiliary Feedwater Pump Automatic Start due to Module Failure in the Anticipated Transient Without Scram System

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 Names	Docket Number(s)
0 8	1 8	9 10	9 10	0 11 10	0 11	1 1	1 15	9 10	NONE	0 5 0 0 0 1 1
										0 5 0 0 0 1 1

OPERATING MODE (9) 1
 POWER LEVEL (10) 8 4
 THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)

<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(c)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)
<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(c)
<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> Other (Specify in Abstract below and in Text)
<input type="checkbox"/> 20.405(a)(1)(iii)	<input type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	
<input type="checkbox"/> 20.405(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
<input type="checkbox"/> 20.405(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)
 Name J. VanLaere, Technical Staff Extension 2346
 TELEPHONE NUMBER 8 1 | 5 | 2 | 3 | 4 | - | 5 | 4 | 4 | 1

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS
X	S J	I M 10 10	S 1 10 12	Y					

SUPPLEMENTAL REPORT EXPECTED (14)
 Yes (If yes, complete EXPECTED SUBMISSION DATE) NO
 Expected Submission Date (15) _____

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

At 0247 on August 18, 1990, with Unit 1 in Mode 1 at 84% power, an unexpected automatic start of the 1A Auxiliary Feedwater pump (AF) [BA] occurred. The cause of the auto start was due to the K1AA relay in the Anticipated Transient Without Scram (ATWS) Mitigation System energizing without the necessary 3 of 4 low steam generator level signals. The licensed Reactor Operator placed the ATWS Mitigating System (AMS) in bypass and returned the pump to standby service.

Troubleshooting did not identify an immediate failure mechanism and the event could not be repeated. However after continued observation, the K1AA actuation relay status light returned to a partially illuminated condition on August 22, 1990. The driver module panel was replaced and AMS was returned to normal on August 31, 1990. The most probable cause of the Drive Module failure is the gradual degradation of an electronic Metal-Oxide Semiconductor Field Effect Transistor due to inductive flyback which allowed trickle current flow until there was sufficient amount of current to energize the relay.

This event is reportable pursuant to 10CFR50.73(a)(2)(iv) due to the automatic actuation of an Engineered Safety Feature.

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TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

A. PLANT CONDITIONS PRIOR TO EVENT:

Event Date/Time 8-18-90 / 0247

Unit 1 MODE 1 - power operation Rx Power 84% RCS [AB] Temperature/Pressure normal operating

Unit 2 MODE 1 - power operation Rx Power 49% RCS [AB] Temperature/Pressure normal operating

B. DESCRIPTION OF EVENT:

Prior to this event on July 25, 1990, the Technical Staff System Engineer (Non-licensed) was assisting the Nuclear Regulatory Commission in conducting a walkdown of the Anticipated Transient Without Scram (ATWS) Mitigating System [5J]. During the walkdown the personnel noticed indicating light LED 12 AFW1 Actuation Relay Status was illuminated. The System Engineer identified this condition as an abnormal status and made a mental note to initiate a work request to correct the condition.

At 0247 on August 18, 1990, with Unit One in Mode 1 at 84% power, an unexpected automatic start of the 1A Auxiliary Feedwater pump (AF) [BA] occurred. The cause of the auto start was due to the K1AA relay in the 1PA54J ATWS cabinet energizing without the necessary 3 of 4 low steam generator level signals present. An investigation identified an indicating light, LED 12 AFW1 Actuation Relay Status, was illuminated. The LED normally illuminates for one of two causes. One cause is test switch TS3 (1HS-FW44) on the 1PA54J cabinet in the PUSH-TO-TEST position and the switch depressed. This verifies continuity through the relay circuit, using 5 volts direct current (VDC), without actuating the equipment. The second cause is when an actuation signal is present (24 VDC) the relay will energize to actuate the equipment. Neither cause existed when the LED was observed to be illuminated. After investigating the cause of the automatic start, the Nuclear Station Operator (NSO) (Licensed Reactor Operator) placed the 1A Auxiliary Feedwater pump control switch on the Main Control Board 1PM06J in the PULL-TO-LOCK position to stop the pump. After the event was discussed with the cognizant Technical Staff Engineer, the ATWS mitigation system (AMS) was placed in the Test/Bypass mode and the 1A Auxiliary Feedwater pump was returned to standby service.

Nuclear Work Request B78832 was written to investigate the cause of the automatic start. The actuation relay, K1AA, was replaced and LED 12 remained illuminated. When the two leads on the TS3 L21 tab were lifted, LED 12 extinguished and a definite click (as in an electronic component de-energizing) was heard in the cabinet by the Instrument Maintenance Department (IM) personnel performing the troubleshooting. The two leads were relanded and LED 12 remained extinguished. Additional troubleshooting using switch TS3 and the AMS logic verified proper operation of the system and the failure could not be reproduced. The AMS cabinet was returned to its normal configuration with the exception of the Master Test/Bypass switch which was left in Test/Bypass to prevent another unexpected actuation. On August 22, 1990 at 0710, LED 12 was observed to be partially illuminated. The 2 of 3/Driver module (LT 2-10) on the AMS panel was replaced. LED 12 was not illuminated following replacement. After several days of observation, the NWR was closed and the AMS Master Test/Bypass switch returned to normal on August 31, 1990.

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TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

No systems were inoperable at the beginning of this event which contributed to this event. Plant conditions remained stable throughout the event.

The NRC Operations Center was contacted at 0405 on 8-18-90 via the Emergency Notification System pursuant to 10CFR50.72 (b)(2)(ii). This event is reportable per 10CFR50.73(a)(2)(iv) due to the automatic actuation of an Engineered Safety Feature.

C. CAUSE OF EVENT:

The root cause of the illuminated LED could not be identified. The most probable cause of the event is the gradual degradation of an electronic Metal-Oxide Semiconductor Field Effect Transistor (MOSFET) internal to the 2 of 3/Driver module due to inductive flyback. The gradual degradation allowed trickle current flow until there was a sufficient amount (approximately 100 milliamperes) to energize the relay. The three relays K1AA, K1BA (1B Auxiliary Feedwater pump), and K1AB (Main Turbine trip) are controlled by different MOSFETs which explains why only the K1AA relay energized. The K1AA relay does not have multiple functions.

The root cause of the System Engineer not initiating corrective action when the indication light was first identified as illuminated was due to a lack of attention to detail.

D. SAFETY ANALYSIS:

Since the plant was in Mode 1, the start of the 1A Auxiliary Feedwater pump had minimal impact on plant operation. There was a slight increase in steam generator levels, but the feedwater regulation valves responded in automatic. The actuation of the K1AA relay did not cause any other unexpected system perturbations. Under more severe initial conditions (i.e. modes 4, 5, or 6) there would still be no adverse consequences since the pump would have been in pull-to-lock.

The 1B Auxiliary Feedwater pump (1AF01P-B) and the Main Turbine trip circuits were operable during this event. Also, the Reactor Protection and Engineered Safety Features systems were operable throughout this event. Therefore, neither plant or public safety was affected by this event.

E. CORRECTIVE ACTIONS:

The Instrument Maintenance Department (IM) personnel performed the troubleshooting efforts on the ATWS mitigation system. No problems were found with the K1AA relay or the TS3 switch. When LED 12 began to illuminate dimly following the troubleshooting of the relay and the switch, the 2 of 3/Driver module was replaced. After monitoring the system to ensure the LED 12 remained extinguished, the ATWS mitigating system was returned to normal configuration.

Operator Aid 90-030 was written to indicate which LEDs should be illuminated during normal power operations (greater than 30% power) and guidelines on actions to be taken if any other LEDs are illuminated.

An Event Evaluation Board was held on September 7, 1990. The following corrective actions were agreed upon during the Board Meeting.

The Assistant Superintendent of Operations decided to revise BAP 335-1, "Operating Shift Turnover and Relief," instead of 1 and 2 BOS 0.1-1,2,3 "Modes 1,2 and 3 Shiftly and Daily Operating Rounds" to include AMS panel 1PA54J. This will accomplish the same goal of verifying status of AMS. In addition a Byron Annunciator Reponse (BAR) will be written. Action Item Record (AIR) 454-225-90-22700 will track this action.

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Byron, Unit 1	0 5 0 0 0 4 5 4	9	0	-	0	1	0	-	0	1	0	4	OF	0	4
TEXT Energy Industry Identification System (EIS) codes are identified in the text as [XX]															

E. CORRECTIVE ACTIONS: (Cont)

Vendor support will be obtained to upgrade the AMS equipment to minimize the effects of inductive flyback. AIR 454-225-90-206 will track this item.

The System Engineer will investigate the option of placing physical labels on the AMS panel to indicate the function of the LEDs. AIR 454-225-90-207 will track this action.

The modification coordinator will review the modification program to determine if there is sufficient review of a new system's impact on plant operation. AIR 454-225-90-208 will track this item.

The cognizant Technical Staff Engineer was reminded of the importance of timeliness in followup on problems identified during system walkdowns. In addition, the Technical Staff Supervisor will define the expectations of system engineers during walkdowns, how they should flag problems identified, and who they should notify of concerns. AIR 454-225-90-204 will track this item.

The Unit 2 AMS modification is being installed during the present refueling outage (B2R02). Similar corrective actions are being completed concurrently on Unit 2.

F. PREVIOUS OCCURRENCES:

The ATWS mitigating system was installed during Unit 1's third refueling outage (B1R03) in February 1990. This event is the first failure experienced at Byron or any Commonwealth Edison Plant relating to the ATWS mitigation system.

Nuclear Network recently documented an AF automatic start due to a procedural deficiency while installing hardware to the ATWS mitigation system.

G. COMPONENT FAILURE DATA:

a.	MANUFACTURER	NOMENCLATURE	MODEL NUMBER	MFG PART NUMBER
	Scientific Applications	module, instrument	----	SA-20F3-00-05

b. In addition, a Nuclear Plant Reliability Data System (NPRDS) search on the ATWS mitigation system module was performed. No similar failures were identified.