



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

October 19, 1994

LTR: BYRON 94-0413  
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)(i)(B) and 10CFR50.73(a)(2)(iv).

This report is number 94-002; Docket No. 50-455.

Sincerely,

G.K. Schwartz  
Station Manager  
Byron Nuclear Power Station

GKS/DSK/bl

Enclosure: Licensee Event Report No. 94-002

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

270207

(9917R/WPF/101194-7)

9410270247 941019  
PDR ADDCK 05000455  
S PDR

*Handwritten initials/signature*

SIGNATURE PAGE FOR LICENSE EVENT REPORT

LER Number  
455: 94-002

Title of Event: Rod Drive Equipment Problems causes Shutdown Bank to remain in Core and subsequent Reactor Trip due to dropped Control Rod

Occurred: 09/23/94 / 0145  
Date Time

OSR DISCIPLINES REQUIRED: ABCFG

Altaff / 10-12-94  
SES DATE

Acceptance by Station Review:

M. Desmar / 10-30-94  
OE ABCFG Date

Kevin Elam / 10/21/94  
SES ACG Date

D. Brunt / 10/26/94  
RAS 9.36 Date

D.K. Johnson / 10-21-94  
OTHER Date

Approved by: GZ Schwartz / 10/23/94  
Station Manager Date

# LICENSEE EVENT REPORT (LER)

FACILITY NAME BYRON NUCLEAR POWER STATION										DOCKET NUMBER 0 5 0 0 0 4 5 5					PAGE 1 OF 0 5	
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TITLE  
ROD DRIVE 2BD POWER CABINET URGENT FAILURES AND SUBSEQUENT REACTOR TRIP DUE TO A DROPPED RCCA

EVENT DATE			LER NUMBER			REPORT DATE			OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQ. NUMBER	REVISION	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0	9	2	9	4	-	0	0	1	None	0 5 0 0 0 0 0 0
0	9	2	9	4	-	0	0	1		0 5 0 0 0 0 0 0

OPERATING MODE		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (CHECK ONE OR MORE OF THE FOLLOWING)									
1		20.402(b)		20.405(e)		X		50.73(a)(2)(iv)		73.71(b)	
POWER LEVEL		20.405(a)(1)(i)		50.36(c)(1)				50.73(a)(2)(v)		73.71(c)	
1 0 0		20.405(a)(1)(ii)		50.36(c)(2)				50.73(a)(2)(vii)		OTHER (Specify in Abstract below and in Text, NRC Form 366A)	
		20.405(a)(1)(iii)		X		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)			
		20.405(a)(1)(iv)		50.73(a)(2)(ii)				50.73(a)(2)(viii)(B)			
		20.405(a)(1)(v)		50.73(a)(2)(iii)				50.73(a)(2)(x)			

LICENSEE CONTACT FOR THIS LER									
NAME M. ROTHENBUELER, SYSTEM ENGINEERING DEPARTMENT, EXT. 2283 B. JACOBSEN, OPERATIONS DEPARTMENT, EXT. 2622								TELEPHONE NUMBER 8 1 5 2 3 4 - 5 4 4 1	

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT											
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	
x	A	A	W	1 2 0	y						
SUPPLEMENTAL REPORT EXPECTED											
YES (If yes, complete EXPECTED SUBMISSION DATE)						X NO		EXPECTED SUBMISSION DATE		MONTH	DAY

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

## ABSTRACT

To repair an intermittent indication-only Urgent Failure on the Unit Two Rod Control System (RD)[AA], Instrument Mechanics replaced a Moving Firing Card in the 2BD Power Cabinet. While performing a surveillance for post maintenance operability, a Stationary Regulation Urgent Failure developed that caused a mismatch of control rods.

Subsequent troubleshooting indicated possible problems with a Stationary Firing Card or a Stationary Regulation Card. During the testing of the effectiveness of the repairs, control rod C07 fell into the core which initiated a negative flux rate reactor trip.

The Urgent Failure was caused by a bad Stationary Firing Card. The dropped control rod was caused by a failed rack connector socket carrying the full current order to the Stationary Regulation Card.

# LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME	DOCKET NUMBER	LER NUMBER			PAGE		
BYRON NUCLEAR POWER STATION		YEAR	SEQ. NUMBER	REVISION			
	0 5 0 0 0 4 5 5	9 4	- 0 0 2	- 0 0	0 2	OF	0 5

TEXT Energy Industry Identification System (EIS) codes are identified in the text as (XX)

## A. PLANT CONDITIONS PRIOR TO EVENT:

Event Date/Time 09/23/94 / 0145

Unit 1 MODE 6 - 0% Rx Power RCS [AB] Temperature/Pressure 86°F / ambient

Unit 2 MODE 1 - 100% Rx Power RCS [AB] Temperature/Pressure NOT/NOP

## B. DESCRIPTION OF EVENT:

On August 28, 1994 Byron Unit Two began experiencing intermittent Main Control Room (MCR) indicated-only "Ghost" Urgent Failures. The Rod Drive System (RD)[AA] is designed to actuate Urgent Failure indications in the MCR and remotely at the originating RD cabinet. The remote indications include the cabinet exterior and typically the cabinet interior. These indications normally remain latched and require operator action to reset. The "Ghost" Urgent Failures appeared in the MCR and spontaneously reset. Between August 28 and September 22, many "Ghost" alarms appeared with a duration of several minutes, but never long enough for troubleshooting to determine its Power Cabinet or Logic Cabinet origin.

On August 30, 1994, Unit Two experienced an Urgent Failure in the 2BD Power Cabinet that provided indications both in the MCR and remotely on the exterior of the 2BD Power Cabinet. There were no internal failure indications. This Urgent Failure differed from the attributes of the "Ghost" failure. Following the replacement of Failure Detector #1 Card, the Urgent Failure cleared.

On the evening of September 22 1994, the "Ghost" alarm appeared for several hours which allowed time for troubleshooting efforts to take place. Working under Work Request 940054685-01, the Instrument Mechanics identified the "Ghost" Urgent Failure originating from the 2BD Power Cabinet and confirmed the Moving Firing Card as suspect. After consulting with System Engineering, the Instrument Mechanics changed out the card and the 2BD Power Cabinet "Ghost" Urgent Failure indication was eliminated.

During the early morning hours of September 23, surveillance 2BOS 1.3.1.2-1 was being performed to exercise the functions of the 2BD Power Cabinet SBB GRP2 Moving Firing Card for post maintenance testing. At 0145 hr, the Rod Motion Control Switch was aligned to insert SBB ten to fifteen steps. Upon request for insertion SBB GRP2 locked up with an Urgent Failure alarm and did not insert. SBB GRP1, however, inserted into the core to 222 steps as indicated on the Digital Rod Position Indication System (DRPI). This lead to a "Rod Deviation -Power Range Tilt" alarm received in the Main Control Room. SBB was declared inoperable in accordance with the requirements of Technical Specification 3.1.3.5. Technical Specification 3.0.3 was also entered due to greater than 1 shutdown bank rod being not fully withdrawn.

The Operators, concerned that any rod movement would result in rods dropping and a reactor trip, contacted the System Engineer. The System Engineer arrived from offsite and actions were taken to ensure that SBB GRP2 would not move. SBB GRP 1 had remained inserted for 2 hours and 19 minutes. To take corrective action, SBB GRP1 was withdrawn to the fully withdrawn park position and Technical Specification 3.0.3 was exited. With all rods fully withdrawn, the Urgent Failure alarm remained in the 2BD Power Cabinet. Station LCOAR Procedure 2BOS 1.3.1-1a remained in effect to document Urgent Failure troubleshooting.

# LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME	DOCKET NUMBER	LER NUMBER			PAGE		
BYRON NUCLEAR POWER STATION		YEAR	SEQ. NUMBER	REVISION			
		0	5	0	0	0	4

TEXT Energy Industry Identification System (EIS) codes are identified in the text as (XX)

## B. DESCRIPTION OF EVENT:

This event is reportable per 10CFR 50.73(a)(2)(i)(B) as an operation or condition prohibited by Technical Specifications.

Subsequent troubleshooting activities on the day shift on September 23, 1994, under work request 940054685-02 included checking electrical current traces during attempted rod movements with SBB GRP2. These current traces revealed that stationary current was being applied beyond the point in the stepping cycle where it was to have deenergized. It is believed that this condition caused the 2BD Power Cabinet Urgent Failure that had locked SBB GRP2 in place.

Further troubleshooting on September 24, 1994, included changing the Stationary Firing Card, Stationary Regulation Card, and the Phase Control Card. After replacing these cards, the Urgent Alarm was reset in the 2BD Power Cabinet. At 1001 hrs, SBB was inserted 5 steps as a post maintenance test. When this action was completed, all SBB GRP1 rods indicated 222 steps on DRPI and all SBB GRP2 rods indicated 228 steps on DRPI, with the exception of Rod C-07, which indicated 210 steps. The step counters on both SBB Groups indicated 22 steps with field verification of rod motion through the 1BD and 2BD Power Cabinets' Cycle exterior light. Operating Personnel, System Engineering Personnel, and Instrument Maintenance Personnel decided after much discussion to withdraw all rods and continue with the troubleshooting. At 1012, as the Operator attempted to withdraw SBB GRP2, rod C-07 dropped into the core, generating a reactor trip on Power Range Negative Flux Rate.

This event is reportable per 10CFR 50.73(a)(2)(iv) an actuation of the Reactor Protection System.

Further troubleshooting activities included checking current traces during SBB GRP2 rod movement. These traces revealed that reduced current orders for the Stationary Gripper were being applied in the stepping cycle when the gripper was supposed to be receiving full current and that the new Stationary Firing Card was degraded. The Stationary Firing Card was re-replaced, however, the lack of full current persisted. It was verified that this condition caused rod C-07 to drop into the core which resulted in the reactor trip. With the lack of full stationary current during the stepping sequence, rods in SBB GRP2 would drop randomly as demonstrated through troubleshooting activities. The cause was found to be a bad rack connector socket for the Stationary Regulation Card.

After repairing the rack connector socket, proper waveform traces were then generated. Prior to the full restoration of the 2BD Power Cabinet, an Urgent Failure again developed that required another replacement of the Failure Detector #1 Card. This failure had different attributes than those previously experienced during recent troubleshooting, such as allowing rod motion.

# LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME	DOCKET NUMBER	LER NUMBER			PAGE		
BYRON NUCLEAR POWER STATION		YEAR	SEQ. NUMBER	REVISION			
		0	5	0	0	0	4

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

## C. CAUSE OF EVENT:

The cause of the misaligned rods and the resulting "Rod Deviation -Power Range Tilt" alarm was determined to be a failure of the SBB GRP2 Stationary Firing Card causing stationary full current to be applied beyond the point in the stepping sequence where it was to be deenergized. This caused the Stationary SBB GRP2 2BD Power Cabine Regulation Urgent Failure.

The cause of the Reactor Trip event on September 24, 1994 was a bent pin in the rack connector socket for the SBB GRP2 Stationary Regulation Card in the 2BD Power Cabinet that resulted in the card not being able to receive full stationary current orders. The lack of a proper connection to this card allowed SBB GRP2 rods to drop into th core and thus initiating a Negative Flux Rate Reactor Trip. It is believed that this pin was bent on September 22 during removal and reinstallation of cards.

From August 28, 1994 through September 22, 1994, the "Ghost" Urgent Failures were caused by the 2BD Powe Cabinet Moving Firing Card.

The Urgent Failures that occurred on August 30, 1994 and September 25, 1994 were caused by the 2BD Power Cabinet Failure Detector #1 Card.

The Urgent Failure that occurred on September 23, 1994 was caused by the 2BD Power Cabinet SBB GRP2 Stationary Firing Card.

## D. SAFETY ANALYSIS:

There were no safety consequences as a result of this event. The health and safety of the public were at no time affected or threatened. All Safe Shutdown Systems actuated and performed as designed. Full Reactor Trip capabilities existed at all times.

## E. CORRECTIVE ACTIONS:

The rack connector socket for the SBB Group 2 Stationary Regulation Card was repaired and SBB Group 2 Stationary Firing Card was replaced.

# LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME	DOCKET NUMBER	LER NUMBER						PAGE													
BYRON NUCLEAR POWER STATION		YEAR		SEQ. NUMBER		REVISION															
		0	5	0	0	0	4	5	5	9	4	-	0	0	2	-	0	0	0	5	OF

TEXT Energy Industry Identification System (EIS) codes are identified in the text as (XX)

## F. RECURRING EVENTS SEARCH AND ANALYSIS:

Reactor trips due to rod drops have occurred previously as described in the following LER's:

<u>LER NUMBER</u>	<u>TITLE</u>
85-042(Unit 1)	Reactor Trips Due to Dropped Rods
85-063(Unit 1)	Reactor Trip Due to Turbine Trip Above P-7
86-028(Unit 2)	Manual Trip Due to Rod Drop Caused by Faulty Circuit Cards
88-063(Unit 1)	Reactor Trip Due to Rod Drop During Manual Control Rod Motion

Appropriate Corrective Actions taken in response to these events have been reviewed. None of the actions taken caused or increased the severity of this event, nor could they have prevented this event from occurring.

## G. COMPONENT FAILURE DATA:

<u>MANUFACTURER</u>	<u>NOMENCLATURE</u>	<u>MODEL NUMBER</u>	<u>MFG PART NUMBER</u>
Westinghouse	Stationary Firing Card	N/A	6050D12G01
Westinghouse	Moving Firing Card	N/A	6050D12G01
Westinghouse	Failure Detector Card #1	N/A	6050D15G01
Westinghouse	Power Cabinet Card Rack Connector Socket	N/A	67168-2