

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

ComEd

December 8, 1997

LTR: BYRON 97-0299
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).

This report is number 97-022; Docket No. 50-454.

Sincerely,



K.L. Koiron
Station Manager
Byron Nuclear Power Station

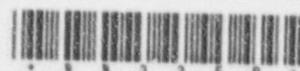
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Enclosure: Licensee Event Report No. 97-022

cc: A. B. Beach, NRC Region III Administrator
NRC Senior Resident Inspector
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NRC FORM 366 (4-95)		U.S. NUCLEAR REGULATORY COMMISSION			APPROVED BY OMB NO. 3150-0104 EXPIRES 04/30/98						
LICENSEE EVENT REPORT (LER)											
(See reverse for required number of digits/characters for each block)											
FACILITY NAME (1) BYRON NUCLEAR POWER STATION, UNIT 1					DOCKET NUMBER (2) 05000454			PAGE (3) 1 OF 6			
TITLE (4) SSPS Logic Testing Not Performed Due to Inadequate Testing Design											
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	
11	14	97	97	022	00	12	08	97	Byron Station, Unit 2	05000455	
									FACILITY NAME	DOCKET NUMBER	
									Braidwood, Units 1 & 2	05000456/457	
OPERATING MODE (9)	5		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)								
POWER LEVEL (10)	000		20.2201(b)			20.2203(a)(2)(v)	<input checked="" type="checkbox"/>		50.73(a)(2)(i)	50.73(a)(2)(viii)	
			20.2203(a)(1)			20.2203(a)(3)(i)			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 R. Hildebrand, System Engineer							TELEPHONE NUMBER (include Area Code) 815-234-5441 X2472				
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)											
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS		
B	JE	N/A	N/A	N/A							
SUPPLEMENTAL REPORT EXPECTED (14)							EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)							<input checked="" type="checkbox"/> NO				

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

On November 14, 1997, Byron Station Unit 1 had entered refueling outage B1R08, was in Mode 5, and proceeding with scheduled activities to enter Mode 6. Byron Station Unit 2 was at full power operation with all safety systems available. During a review of Generic Letter 96-01 (Testing of Safety Related Logic Circuits), a discovery within the industry revealed current Solid State Protection System (SSPS) [JE] [JG] testing was inadequate. Byron and Braidwood Stations determined current SSPS testing did not test all functions of some memory logic circuits. As such, a missed surveillance condition was determined to exist.

The cause for this event was that the original testing design prescribed by the vendor did not fully verify proper operation of the SSPS logic cards. Corrective action to resolve the inadequate testing is to add new testing criteria to the SSPS Bi-monthly surveillance procedures. Unit 2 Train A/B SSPS Bi-Monthly testing was successfully performed on 11/14/97. Unit 1 Train A/B SSPS Bi-Monthly testing will be performed prior to Unit 1 entering Mode 4 while returning to power operation from refueling outage B1R08.

There were no adverse consequences to the health and safety of the general public or plant personnel as a result of this event. This event is reportable per 10CFR50.73(a)(2)(i)(b)-any operation or condition prohibited by the plant's Technical Specifications.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	97	022	00	2 OF 6

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

A. PLANT CONDITIONS PRIOR TO EVENT:

Event Date/Time 11-14-97 / 0950

Unit 1 Mode - 5 - Cold Shutdown Rx Power 0% RCS [AB] Temperature/Pressure 120 deg./350 psig
 Unit 2 Mode - 1 - Power Operation Rx Power 99.7% RCS [AB] Temperature/Pressure NOT/NOP

B. DESCRIPTION OF EVENT:

On November 14, 1997, Byron Station Unit 1 had entered refueling outage B1R08 and was in Mode 5, and proceeding with scheduled activities to enter Mode 6. Byron Station Unit 2 was at full power operation with all safety systems available. During a Generic Letter 96-01 review (Testing of Safety Related Logic Circuits), a discovery within the industry revealed that current Solid State Protection System (SSPS) [JE] [JG] surveillance testing may be inadequate. Byron and Braidwood Stations determined that current SSPS surveillance testing was inadequate because it did not test all required functions of some memory logic circuits. The Source Range Automatic P-10 Block, Feedwater Isolation on P-14 Steam Generator Hi-Hi Level and Feedwater isolation on Safety Injection protective functions could have been masked by failures not detectable by the surveillance testing. The problem with the current testing method is that the way the internal testing scheme is configured, a postulated failure, that of an open diode, on various inputs within the associated universal logic card for these circuits would not be detected during testing. SSPS surveillance testing is required on a Bi-monthly frequency. A review was performed and the inadequate surveillance of the SSPS was determined to be a missed surveillance requirement. Byron Station Unit 2 entered Technical Specification Action 4.0.3, which provided 24 hours to complete the surveillance testing. The revised testing performed on Unit 2 on 11/14/97, confirmed that there were no equipment failures in the SSPS logic card circuits that were affected. Byron Station Unit 1 was in Mode 5 and the affected portion of the SSPS was not required to be operable. The identification of a missed Technical Specification surveillance requirement made this event reportable per 10CFR50.73(a)(2)(i)(b)- any operation or condition prohibited by the plant's Technical Specifications.

The inadequate testing involved the use of Universal Logic Boards in a memory configuration in conjunction with the SSPS internal semi-automatic tester designed by Westinghouse. There are three memory circuit functions that were inadequately tested: The Source Range (SR) [IG] Automatic P-10 Block (Memories switch position 3), Feedwater (FW) [JB] Isolation on P-14 Steam Generator Hi-Hi Level (Memories switch Position 10) and Feedwater (FW) [JB] Isolation on Safety Injection (SI) [BQ] (Memories switch position 11). During the Memories portion of the SSPS testing, the Memories switch is placed in different positions to test different functions. For the case of P-14 FW Isolation (Universal Logic Board A213), the Memories switch is placed in position 10. A ground is provided through S506 deck C through the Reset pushbutton to Universal Logic Board card A213 input I1 logic. The card is looking for two logic low inputs, (2 out of 4) to provide an output signal for FW Valve Isolation. When the Set pushbutton is depressed, a logic low is applied to the input at terminals T3 and T4. Terminals T3 and T4 are externally jumpered together so that a P-14 signal is applied to both inputs. At this point, three inputs are low and the card will output a signal that illuminates the Memory Set lamp. Also, the output from the card feeds back through a four input (I2) logic to seal in the signal. When the Set pushbutton is released, the logic low is removed from the T3 and T4 inputs. The Memory Set lamp remains illuminated because of the I1 input provided through the Reset pushbutton and the I2 seal-in from the output. At this point, the Reset pushbutton is depressed which removes the logic low input from I1 and the Memory Set lamp extinguishes. The inadequacy associated with this testing scheme is that when the Set pushbutton is depressed, there are logic lows provided at three of the card inputs. It only takes two logic lows for the logic to be satisfied, so both T3 and T4 P-14 inputs are not confirmed. It could be postulated that an internal card failure, such as diode CR10 failing open, would not be detected by our testing.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	97	022	00	3 OF 6

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

B. DESCRIPTION OF EVENT (cont.)

The T4 input from P-14 and the I1 input through the Reset pushbutton would be sufficient to satisfy the logic and illuminate the lamp. The significance of this postulated failure is that during normal operation, a valid P-14 signal would not actuate the FW Valve Isolation unless a P-4 Reactor Trip signal was present. A similar scenario also exists for the other two memory functions; SR Automatic P-10 Block (Memories switch position 3), and FW Isolation on SI (Memories switch position 11).

The SI FW Isolation circuitry and the P-14 FW Isolation circuitry are tested each refueling outage during the time response test. Proper operation of the cards is confirmed by simulating actual signals and timing the response through the circuits. However, the surveillance frequency of Bi-monthly testing for the SSPS was not being satisfied for these three functions. The original testing design by Westinghouse [W120] for these three circuits was inadequate and did not fully verify proper operation of the SSPS logic cards. The testing may not have detected a failed diode condition that could have masked signals from the Source Range Automatic P-10 Block, Feedwater Isolation on P-14 Steam Generator Hi-Hi Level and Feedwater Isolation on Safety Injection inputs. This problem has existed in the SSPS since initial plant startup for both Byron/Braidwood units.

The solution to resolve the inadequate testing is to add new testing criteria to the SSPS surveillance procedures after the existing memories testing is completed. Solid State Protection System Bi-monthly Testing Surveillance Procedures (1/2BOS 3.1.1-20/21) will be revised to include the new testing requirements. For the three switch positions where the inadequate testing exists, several testing steps will confirm proper operation of the cards. For the case of the P-14 FW Isolation, the following steps will be added:

- 1) Place Memories Test switch to position 10.
- 2) Depress and hold the Reset (black) pushbutton and verify the Memory Set lamp is extinguished (this will remove the logic low input from I1).
- 3) Depress the Set (red) pushbutton and verify the Memory Set lamp is illuminated, (this verifies that both T3 and T4 are operating correctly since they provide the only two logic low inputs to the card).
- 4) Release the Set pushbutton and verify the Memory Set lamp extinguishes (note that with the Reset pushbutton depressed, the card will not seal in).
- 5) Release the Reset pushbutton and verify the Memory Set lamp remains extinguished.

These steps are also required to be repeated for Memories switch positions 3 and 11 to complete the testing for SR Automatic P-10 Block (Memories switch position 3), and FW Isolation on SI (Memories switch position 11).

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	97	022	00	4 OF 6

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

C. CAUSE OF EVENT:

The cause for this event was that the original testing design prescribed by the vendor did not fully verify proper operation of the SSPS logic cards. During a Generic Letter 96-01 review (Testing of Safety Related Logic Circuits), a discovery within the industry revealed that current SSPS surveillance testing may be inadequate for some of the logic circuits. The review postulated a diode was failed open on Universal Logic Cards associated with the SR Automatic P-10 block, FW Isolation on P-14 Steam Generator Hi-Hi Level, and FW Isolation on SI and could go undetected by the prescribed SSPS surveillance testing. A subsequent review by both Byron and Braidwood determined that the sites current SSPS surveillance testing was inadequate. The testing results, prior to this event, could have masked a failed diode condition. As such, a missed surveillance condition was determined to exist. The existence of this postulated failure, and its subsequent effects, apparently was not previously realized by either the card vendor [W120] nor the industry.

D. SAFETY ANALYSIS:

The purpose of the P-14 and SI circuits is to provide a close signal to the designated Feedwater Isolation valves. In a situation where either a P-14 or SI event were to occur, a turbine trip and trip of the main feedwater pumps along with closure of the associated pump discharge valves would occur regardless of the presence of an open diode in the subject circuit. In the case of the SI portion of the circuit, when an SI signal is generated, a reactor trip signal is also generated. With the generation of a reactor trip signal, a P-4 signal would be present shortly thereafter allowing the subject Feedwater Isolation signal to be processed, even in the presence of the postulated open diode. In the case of a Steam Generator Hi-Hi level (P-14) signal, the automatic actuation would be processed when operating greater than the P-8 setpoint (30% Nuclear Power). A P-4 reactor trip signal would be indirectly received as a result of the P-14 turbine trip. In the case where a P-14 signal was present while operating less than the P-8 setpoint, a reactor trip signal would not be automatically generated or indirectly received as a result of the turbine trip. The unsuccessful automatic actuation of the feedwater valves could only occur in this case if both SSPS trains were to have the postulated failures. Station emergency operating procedures direct operators to verify automatic feedwater isolation has occurred following reactor trip or SI. If not, manual actions are taken to close the affected valves.

The purpose of the Source Range blocking circuit involving P-10 is to provide a backup blocking signal to P-6 and its associated seal-in during operations greater than 10% Nuclear Power. The function of the P-10 input is to maintain a block of the Source Range Hi Flux trip signals, in the event of a loss of both the P-6 and seal-in inputs to the circuit card. If this situation were to occur in conjunction with an open diode in the P-10 input portion of the circuit, the Source Range Hi Flux trip signals would be unblocked resulting in a reactor trip. This scenario is considered remote since it relies on multiple failures to occur.

The revised testing performed on Unit 2 on 11/14/97, confirmed that there were no equipment failures in the SSPS logic card circuits that were affected. Therefore, a valid P-14 signal would have actuated the FW Valve Isolation. Also, a valid signal for the Source Range Automatic P-10 Block or Feedwater Isolation on Safety Injection would have generated the desired actions required to initiate proper system actuation.

This event did not adversely affect any other safety system nor the operator's ability to maintain safe reactor plant conditions. Therefore, there were no adverse consequences to the health and safety of the general public or plant personnel as a result of this event.

NRC FORM 366A (4-95)		U.S. NUCLEAR REGULATORY COMMISSION				
LICENSEE EVENT REPORT (LER) TEXT CONTINUATION						
FACILITY NAME (1)		DOCKET	LER NUMBER (6)			PAGE (3)
BYRON NUCLEAR POWER STATION, UNIT 1		05000454	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 OF 6
			97	-- 022	-- 00	

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

E. CORRECTIVE ACTIONS:

The on-going Generic Letter 96-01 review (Testing of Safety Related Logic Circuits), of the Solid State Protection System has not identified any other circuits with similar logic configurations that contributed to this event.

Unit 2 Train A/B Solid State Protection System Bi-monthly testing Surveillance procedures 2BOS 3.1.1-20 and 21 were temporarily revised as Temporary Procedures 97-2-216 and 217 respectively, to include the required SSPS memory circuit testing. Unit 2 Train A/B Solid State Protection System Bi-monthly testing was successfully performed on 11/14/97, using Temporary Procedures 97-2-216 and 217.

Unit 2 Train A/B Solid State Protection System Bi-monthly Surveillance Procedures 2BOS 3.1.1-20 and 21 will be permanently revised to include the required memory circuit testing prior to their next required use. (NTS #454-180-97-SCAQ00022-03 and 04)

Unit 1 Train A/B Solid State Protection System Bi-monthly Surveillance Procedures 1BOS 3.1.1-20 and 21 will be permanently revised to include the required memory circuit testing prior to their next required use. (NTS #454-180-97-SCAQ00022-01 and 02)

Unit 1 Train A/B Solid State Protection System Bi-monthly testing Surveillance Procedures 1BOS 3.1.1-20 and 21 will be performed prior to Unit 1 entering Mode 4 from the refueling outage B1R08, using the new revisions of 1BOS 3.1.1-20 and 21. (NTS #454-180-97-SCAQ00022-05)

F. RECURRING EVENTS SEARCH AND ANALYSIS:

Two computer searches were done using the Byron Regulatory Assurance "RABY" database. The first search used the keywords "Inadequate and Testing." The second search used the keywords "Missed and Surveillance." The following are the applicable documents that were found during the searches. Only LERs were considered in the search.

LER 455/93-001, "Wiring Error in SSPS Test Circuit on 3 of 4 Trains."

A wiring problem in the SSPS system resulted in a portion of the SSPS system not being tested. The cause of this event was due to the manufacturers [W120] incorrect wiring of the cabinet prior to delivery. The corrective actions from this event would not have prevented this event.

LER 454/97-009, "Missed Technical Specification Surveillance."

This LER was written because the station was not venting the Chemical and Volume Control (CV) [CB] pump casings and discharge piping high points outside of containment once every 31 days as required by Technical Specifications. One of the corrective actions requires a review of selected Technical Specification surveillances for literal compliance. This action would not have prevented this event because it would not have considered the design deficiency that caused this event.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		-YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	97	022	00	6 OF 6

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

F. RECURRING EVENTS SEARCH AND ANALYSIS (cont.)

LER 454/97-010, "Faulty Review Causes Failure to Test Relays and Technical Specification 3.0.3 Entry."

The letdown containment isolation valve slave relay contacts and the letdown orifice block valve relay contacts were not tested on a quarterly basis. The cause for this event was a deficient Onsite Review that allowed electrical jumpers to be used to prevent closure of the valves. The corrective actions included a review of selected surveillances for Technical Specification compliance. The corrective actions from this event would not have prevented this event because they would not have considered the design deficiency that caused this event.

LER 454/97-014, "Testing of P-11 Permissive Missed Due to Inadequate Procedure."

During a review of an industry Operating Experience which identified a lack of proper testing of the P-11 interlock circuitry, it was determined that the same situation existed at Byron Station. Because of this deficiency a valid test of the entire channel, for the P-11 function, as defined by Technical Specifications was not met. The cause of the event was due to improper development of the surveillance procedure to properly test the P-11 function as it leaves the process protection system instrumentation and inputs into the Solid State Protection System. The corrective actions were to revise the procedures to test the input relays at power. The corrective actions from this event would not have prevented this event because they would not have considered the design deficiency that caused this event.

G. COMPONENT FAILURE DATA:

None.