

Commonwealth Edison Company  
Braidwood Generating Station  
Route #1, Box 84  
Braceville, IL 60407-9619  
Tel 815-458-2801

**ComEd**

December 10, 1997  
BW/97-0067

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

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

This report is Number 97-010-00, Docket No. 50-456.

Yours truly,

  
G. K. Schwartz  
Station Manager  
Braidwood Nuclear Station

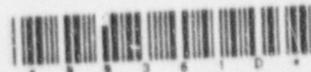
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Encl.: Licensee Event Report  
No. 456-97-010-00

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 INFORMATION COLLECTION REQUEST: 30.0 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 (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT

FACILITY NAME (1): <b>BRAIDWOOD NUCLEAR POWER STATION, UNIT 1</b>		DOCKET NUMBER (2) <b>05000456</b>	PAGE (3) <b>1 of 6</b>
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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	010	00	12	12	97	Braidwood Station, Unit 2	05000457
									Byron Station Units 1 & 2	05000454, 455

OPERATING MODE (9) **1**  
POWER LEVEL (10) **100**

**THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)**

<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 73.71(b)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(c)
<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> OTHER
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.73(a)(2)(vii)	(Specify in Abstract below and in Text, NRC Form 366A)
<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME <b>Albert M. Stogsdill, System Engineer</b>	TELEPHONE NUMBER (Include Area Code) <b>(815) 458-2801 Extension 2843</b>
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CURE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewriter lines 16)

On November 14 1997, Braidwood Unit 1 was at full power operation with all safety systems available. Braidwood Station Unit 2 was in refueling outage A2R06, Mode 3 with all safety systems available, and preparing for reactor startup. 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) testing was inadequate. Braidwood and Byron 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 1 Train A/B SSPS Bi-Monthly testing was successfully performed on 11/14/97. Unit 2 Train A/B SSPS Bi-Monthly testing was successfully performed on 11/19/97.

There were no adverse consequences to the health and safety of the general public or plant personnel as a result of this event. There have been four (4) previous events involving inadequate surveillances. 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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS 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)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BRAIDWOOD UNIT 1	05000456	97	010	00	2 of 6

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

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

Unit(s): 01/02	Event Date: 11-14-97	Event Time: 0950 Hours
Reactor Mode(s): 1/3	Power Level(s): 100%/0%	RCS [AB] Temp./Press. / NOT/NOP
		NOT/NOP

**B. DESCRIPTION OF EVENT:**

There were no systems or components inoperable at the beginning of this event that contributed to the severity of the event.

On 11/14/97, in response to information received from another utility the internal semi-automatic testing scheme of the Solid State Protection Systems (SSPS) was found to be inadequate in the testing for three circuits. The discovery of this problem at that utility was found during a review of testing performed in accordance with Technical Specifications in response to NRC Generic Letter 96-01. The circuits identified were the Source Range blocking scheme (P-10), and the Safety Injection (SI) and Steam Generator HI-HI Level (P-14) functions for actuation of the Feedwater Isolation Valves. 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. If this condition were to exist, this would prevent the Feedwater Isolation actuation from occurring from an SI or P-14 signal. A similar situation was found with the Source Range blocking scheme involving permissive P-10. Upon receiving this information the issue was reviewed by the Braidwood and Byron SSPS System Engineers for applicability. As a result of the review and discussions with both station's management, it was determined that this problem was applicable to both sites and compliance with Technical Specification surveillance testing requirements was not met. As a result of a further review of the situation at Braidwood, it was determined that Braidwood Unit 2 could meet the current surveillance testing requirements due to recent SSPS preventative maintenance performed during refueling outage A2R06. Details of this justification can be found in Braidwood On-Site Review #97-180. Immediate actions taken for Braidwood Unit 1 were to declare a missed surveillance for the testing of the SSPS Trains for the functions identified and applying Technical Specification 4.0.3. An adequate test for the subject functions was developed by System Engineering utilizing the existing semi-automatic test hardware within the SSPS and incorporated into the SSPS bi-monthly surveillances. During the afternoon of 11-14-97, both Braidwood Unit 1 SSPS Trains were tested successfully using the SSPS bi-monthly surveillances incorporating the new testing. Technical Specification 4.0.3 was then exited as a result of the successful tests. The Braidwood Unit 2 SSPS Trains were later tested with successful results on 11-19-97.

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BRAIDWOOD UNIT 1	05000456	97	010	00	3 of 6

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

**B. DESCRIPTION OF EVENT (continued):**

Details of the inadequate testing involve the use of Universal Logic Boards in a memory configuration in conjunction with the SSPS internal semi-automatic tester designed by Westinghouse. The three functions found to be inadequately tested are identified as the Source Range Automatic P-10 Block (Memory Switch position 3, Westinghouse SSPS Schematic Diagram Sheet 3), Feedwater Isolation on P-14 S/G Hi-Hi Level (Memory Switch position 10, Westinghouse SSPS Schematic Diagram Sheet 21), and Feedwater Isolation on a Safety Injection (Memory Switch position 11, Westinghouse SSPS Schematic Diagram Sheet 21). During the Memories portion of the SSPS testing, the Memories switch is placed in different positions to test different functions. For the case of the P-14 Feedwater Isolation (Universal Board A213 for Braidwood and Byron), the Memories switch is placed in position 10. A ground is provided through S506 Deck C through the Reset pushbutton to one of the A213 inputs (I1). The card is looking for two logic low inputs (basically a 2 out of 4) to provide an output signal for Feedwater Isolation. When the Set pushbutton is depressed, a logic low is applied to the inputs at T3 and T4 (they are externally jumpered together so that a P-14 signal is applied at both inputs). At this point, three inputs are satisfied and the card will output a signal which illuminates the Memory Lamp. Also, the output feeds back through a fourth input (I2) to seal in the signal. When the Set pushbutton is released, the logic low is removed from the T3 and T4 inputs. The Memory Lamp stays illuminated because of the I1 input provided through the Reset pushbutton and the I2 seal-in input from the output. At this point, the Reset pushbutton is depressed which removes the logic low input from I1 and the Memory 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 for the logic to be satisfied, so both T3 and T4 P-14 inputs are not confirmed. We could postulate an internal card failure (i.e. diode CR10 fails open) which would not be detected by our testing (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 real P-14 signal would not actuate the Feedwater Isolation unless a P-4 Reactor Trip signal was present. A similar scenario also exists for the other two memory functions listed above.

The Safety Injection Feedwater Isolation circuitry and the P-14 Feedwater 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 bimonthly testing for the SSPS is not being satisfied for these three functions.

This event is reportable under 10CFR50.73(a)(2)(i)(B) as any operation or condition prohibited by the plant's Technical Specifications. This

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

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BRAIDWOOD UNIT 1	05000456	97	010	00	4 of 6

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

**B. DESCRIPTION OF EVENT (continued):**

problem has existed in the SSPS since initial plant startup for both Braidwood/Byron Units.

**C. CAUSE OF EVENT:**

The original internal testing design of the SSPS for these three circuits was inadequate and did not fully verify proper operation of the associated SSPS logic cards for their designated functions. The existence of this postulated failure, and its subsequent effects, apparently was not previously realized by either the card vendor nor the industry.

**D. ASSESSMENT OF SAFETY CONSEQUENCES:**

The purpose of the subject P-14 and SI circuit is to provide a close signal to a majority of 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 review of the impact on plant safety in regards to the consequences of the postulated open diode in either input circuit the following analysis is made. 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 would be present shortly thereafter allowing the subject Feedwater Isolation signal to be processed even in the presence of the postulated open diode. The time for this automatic action would be well within the response time allowed for the Feedwater Isolation actuation to occur. In the case of a situation where a Steam Generator Hi-Hi level (P-14) were present would also result in the automatic actuation being processed when operating greater than the P-8 setpoint (30% Nuclear Power). A P-4 signal would be indirectly received as a result of the turbine trip processed causing a reactor trip to be generated and thus a P-4 received. The time for this automatic action would be well within the response time allowed for the Feedwater Isolation actuation to occur. The circuit in the case of a situation where a Steam Generator Hi-Hi level (P-14) were present and operating less than the P-8 setpoint would not respond similarly as in the case of the SI signal since a reactor trip signal would not be automatically generated or indirectly received as a result of the turbine trip. In review of this last scenario when operating less than P-8 the unsuccessful automatic actuation of the feedwater valves could only occur if both SSPS trains were to have the postulated failures. In addition, appropriate operator actions can be assumed to assist in mitigation of this event where a malfunction of the feedwater system could occur resulting in a Steam Generator Hi-Hi level.

The purpose of the inadequately tested Source Range blocking circuit involving P-10 is to provide a backup blocking signal in addition to P-6 and it's associated seal-in during operations greater than 10% nuclear power. The function of the P-10 input is to maintain a block of the

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BRAIDWOOD UNIT 1	05000456	97	010	00	5 of 6

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

**D. ASSESSMENT OF SAFETY CONSEQUENCES (continued):**

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 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 operators 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.

**E. CORRECTIVE ACTIONS:**

The solution to this inadequate testing is to add additional new testing after the existing Memories testing is completed during the SSPS Bi-monthly surveillances. In the three Memories switch positions where the inadequate testing exists, several additional testing steps will confirm proper operation of the cards. For the case of the P-14 Feedwater Isolation the following steps should be added:

- 1) Place Memories Test Switch to position 10.
- 2) Depress and hold the Reset pushbutton and verify Memory lamp is extinguished (this will remove the logic low input from I1).
- 3) Depress the Set pushbutton and verify Memory lamp illuminates (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 lamp extinguishes (note that with the reset pushbutton depressed, the card will not seal in).
- 5) Release the Reset pushbutton and verify the Memory lamp remains extinguished. These steps should then be repeated for the other applicable logic switch positions (positions 3, 10, and 11 are the applicable positions for the three functions at Braidwood and Byron).

The surveillance procedures (listed below) at Braidwood were permanently revised and both SSPS trains for each of the units at Braidwood were tested. The results of the testing performed incorporating the additional testing was successful for all four (4) SSPS trains.

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BRAIDWOOD UNIT 1	05000456	97	010	00	6 of 6

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**E. CORRECTIVE ACTIONS (continued):**  
(SSPS Bi-monthly Surveillances)

- 1) 1BwOS 3.1.1-20 "Unit One SSPS, Reactor Trip Breaker, and Reactor Trip Bypass Breaker BI-Monthly (Staggered) Surveillance (Train A)"
- 2) 1BwOS 3.1.1-21 "Unit One SSPS, Reactor Trip Breaker, and Reactor Trip Bypass Breaker BI-Monthly (Staggered) Surveillance (Train B)"
- 3) 2BwOS 3.1.1-20 "Unit Two SSPS, Reactor Trip Breaker, and Reactor Trip Bypass Breaker BI-Monthly (Staggered) Surveillance (Train A)"
- 4) 2BwOS 3.1.1-21 "Unit Two SSPS, Reactor Trip Breaker, and Reactor Trip Bypass Breaker BI-Monthly (Staggered) Surveillance (Train B)"

There are no further corrective actions necessary at Braidwood Station regarding this issue.

An effectiveness review will be performed for the corrective actions for this event. This will be tracked by NTS item #456-180-97-SCAQ00010ER.

**F. PREVIOUS OCCURRENCES:**

A search was conducted for items concerning inadequate surveillances.

LER NUMBER	TITLE
05000456-93-003	Missed Tech Spec Surveillance Due To Preservice Design Deficiency In SSPS Test Circuitry
05000456-97-005	Inadequate P-11 ACOT/Channel Calibration Due to Defective Procedure.

A review of the corrective actions for the above LERs determined that they would not have prevented the current event.

**G. COMPONENT FAILURE DATA:**

MANUFACTURER --- NOMENCLATURE      MODEL      MFG. PART NO.

Since no component failure occurred, this section is not applicable.