



Carolina Power & Light Company

Brunswick Nuclear Plant  
P. O. Box 10429  
Southport, N.C. 28461-0429

APR 08 1993

FILE: B09-13510C  
Serial: BSEP-93-0053

10CFR50.73

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

BRUNSWICK STEAM ELECTRIC PLANT UNIT 1  
DOCKET NO. 50-325  
LICENSE NO. DPR-71  
LICENSEE EVENT REPORT 1-93-08

Gentlemen:

In accordance with Title 10 of the Code of Federal Regulations, the enclosed Licensee Event Report is submitted. This report fulfills the requirement for a written report within thirty (30) days of a reportable occurrence and is submitted in accordance with the format set forth in NUREG-1022, September 1983.

Very truly yours,

C. C. Warren, Plant Manager - Unit 2  
Brunswick Nuclear Plant

SFT/

Enclosure

cc: Mr. S. D. Ebner  
Mr. P. D. Milano  
BSEP NRC Resident Office

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9304130314 930412  
PDR ADOCK 05000325  
S PDR

*Handwritten initials: EE22*

EXPIRES: 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.0 HRS. 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 (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)

Brunswick Steam Electric Plant, Unit 1

DOCKET NUMBER (2)

05000325

PAGE (3)

1 of 7

TITLE (4)

Severe Winter Storm Results in Spurious ESF Actuations and a Loss of Off-site Power

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
03	13	93	93	- 08 -	000	04	12	93	BNP Unit 2	05000324
									FACILITY NAME	DOCKET NUMBER
										05000

  

OPERATING MODE (9)	04	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more of the following)(11)							
POWER LEVEL (10)	00	20.402(b)		20.405(c)	X	50.73(a)(2)(iv)		73.71(b)	
		20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)	
		20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER	
		20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)	(Specify in Abstract and Text)		
		20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)			
		20.405(a)(1)(v)	X	50.73(a)(2)(iii)		50.73(a)(2)(x)			

## LICENSEE CONTACT FOR THIS LER (12)

NAME

Steve F. Tabor, Regulatory Compliance Specialist

TELEPHONE NUMBER

(919) 457-2178

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

## SUPPLEMENTAL REPORT EXPECTED (14)

X YES (If yes, complete EXPECTED SUBMISSION DATE)		NO		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
					06	30	93

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

On March 13, 1993, beginning at 1425 hours, while Units 1 and 2 were in cold shutdown, spurious Emergency Safeguard Feature (ESF) system initiations occurred on each unit. The initiations were caused by on-site electrical distribution system voltage depressions. These depressions were due to the simultaneous loss of two of four Unit 1 and one of four Unit 2 incoming transmission lines. The loss of the transmission lines was caused by high winds resulting from a severe winter storm. High winds caused a wood pole H-frame transmission line structure to fall onto an adjacent transmission line. This resulted in the loss of two of the four off-site power sources to Unit 1. Failure of the support structure also caused deflection of crossing transmission lines resulting in the loss of one of four Unit 2 off-site power sources. The failed Unit 2 off-site power source was restored at 1622 hours. During the severe weather, from 1731 to approximately 2037 hours, voltage fluctuations resulting from the loss of a third incoming line caused four additional Unit 1 ESF initiations. The third Unit 1 incoming line was restored at approximately 2155 hours. The remaining Unit 1 off-site lines were restored by March 14, 1993 at approximately 2026 hours. On March 16, 1993, as a result of the March 13 winter storm, a Loss of Off-site Power (LOOP) occurred due to excessive salt build-up on switchyard insulators. A supplement to this LER will be provided to address the details of the LOOP including the root cause and corrective actions to prevent recurrence.

The cause classification for this event per the criteria of NUREG-1022 is C (external).

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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Brunswick Steam Electric Plant Unit 1	05000325	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 of 7
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TEXT (If more space is required, use additional NRC Form 366A's) (17)

TITLE

Severe Winter Storm Results in Spurious ESF Actuations and a Loss of Off-site Power

INITIAL CONDITIONS

On March 12, 1993, at 1609 hours, the CP&L Corporate Meteorologist contacted the Brunswick Control Room and informed Operations of the potential for a severe storm. At 1250 hours, on March 13, 1993, the Corporate Meteorological Unit forecasted sustained high winds of 40 to 50 mph with gusts to 70 mph. Administrative Instruction (AI) 68 (Brunswick Nuclear Project Response to Severe Weather Warnings) was implemented based on the storm warning. Both Units 1 and 2 were in Cold Shutdown at the time of the severe weather. Unit 1 off-site power was being supplied to the plant by "backfeeding" through the Unit 1 Unit Auxiliary Transformer. Power to the Unit 1 "A" channel of the RPS was being supplied by the alternate source and consequently the Unit 1 RPS A channel Motor Generator Set was not in service. Unit 2 off-site power was being supplied through the Unit 2 Startup Auxiliary Transformer.

EVENT NARRATIVE

On March 13, 1993, at 1425 hours, a severe winter storm containing hourly average wind speeds in excess of 50 mph and wind gusts up to 100 mph caused one pole of a wooden two pole H-frame transmission line structure (structure #10) supporting the Brunswick Unit 1 - Jacksonville 230 KV transmission line to fail by breaking at the groundline. The resultant loading from conductors and gale wind forces caused the structure's second pole break approximately two feet above groundline. The structure failure caused conductors to come in contact with conductors of the adjacent Brunswick Unit 1 - Castle Hayne East 230 KV transmission line. This resulted in a loss of two of the four Unit 1 off-site power sources.

The Brunswick Unit 1 - Jacksonville 230 KV transmission line crosses the Brunswick - Unit 2 Castle Hayne West 230 KV transmission line. The failure of structure #10 caused an overhead static ground wire to pull downward and into the phase conductors of the Brunswick Unit 2 - Castle Hayne West 230 KV transmission line resulting in the loss of one of the four Unit 2 off-site power sources.

The resulting voltage fluctuations on the on-site electrical distribution system caused the following Unit 1 and Unit 2 system initiations:

Unit 1:

A half Group 1 isolation (Main Steam Isolation Valves)

A half Group 2 isolation resulting in the closure of the Drywell Floor and Equipment Drain Inboard Isolation valves, 1-G16-F003 and 1-G16-F019

A half Group 3 isolation resulting in the de-energization of the Reactor Water Cleanup (RWCU) Inboard Isolation Valve, 1-G31-F001 (This valve de-energized and remained in the open position because its associated MCC breaker was racked out with the valve in the open position to support on-going valve maintenance.)

A Group 6 isolation resulting in the isolation of the Containment

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

Atmospheric Control (CAC) valves, Reactor Building Ventilation isolation, and Standby Gas Treatment System (SGTS) initiation

A half Group 8 isolation resulting in the closure of the 1-E11-F009 valve and the loss of Shutdown Cooling

A half Group 10 isolation resulting in the closure of the Primary Containment Pneumatic Supply Valves - Division II only

A half scram of the Reactor Protection System (RPS) - "A" logic channel only

The loss of the RWCU System Filter Demineralizer and RWCU pump trip

Unit 2:

A Group 1 isolation (No MSIVs closed since the valves were in the closed position prior to the event.)

A Group 6 isolation resulting in the closure of the Containment Atmospheric Control (CAC) valves and an isolation of the Reactor Building Ventilation System

The generation of a SGTS start signal (The system did not start since the SGTS was under clearance prior to the event in support of maintenance activities.)

A Group 10 isolation resulting in the isolation of both divisions of the Primary Containment Pneumatic Supply Valves

2B RWCU pump trip

At 1429 hours, Unit 1 Shutdown Cooling was restored. During the four minutes Shutdown Cooling was isolated, no increase in the reactor coolant temperature was observed. At 1435 hours, an Unusual Event was declared as a precautionary measure due to the loss of three off-site power sources and to increase the state of readiness should other off-site power sources become inoperable during the storm.

By approximately 1515 hours, the Unit 2 equipment affected by the electrical system transients was restored to normal operation. By approximately 1615 hours, the affected Unit 1 equipment was restored to normal operation with the exception of the RWCU Filter Demineralizer which was secured off-line pending backwash.

At 1622 hours, the failed Unit 2 Castle Hayne West 230 KV off-site power source was restored.

At approximately 1730 hours, a third Unit 1 off-site power source, Unit 1 - Delco East, tripped momentarily. This momentary loss of the third Unit 1 off-site power source resulted in voltage fluctuations to the on-site electrical distribution system and the following system initiations:

Unit 1 SGTS initiation

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Unit 1 Reactor Building Ventilation system isolation

Unit 1 Drywell Purge Fan Isolation

Actuation of the Unit 1 Battery Bus Ground Annunciator (This annunciator cleared immediately following the reclosing of the third Unit 1 off-site power source.)

Actuation of the Unit 1 Main Transformer Trouble Annunciator

At 1755 hours, the Main Transformer Trouble annunciator was reset. The annunciator was initiated due to detection of an undervoltage condition. By 1810 hours, the affected equipment was restored to normal operation.

At 1948 hours, the Unit 1 - Delco East off-site power source tripped a second time resulting in on-site voltage fluctuations and the following system initiations:

A Group 1 isolation resulting in the closure of the Unit 1 Main Steam Isolation Valves

A half Group 6 isolation resulting in the closure of the Unit 1 CAC valves - Division II only

A half Group 10 isolation resulting in the closure of the Unit 1 Primary Containment Pneumatic Supply Valves - Division II only

A half scram of the Unit 1 RPS ("A" logic channel)

At 1951 hours, the Unit 1 - Delco East off-site power source was restored. The affected Unit 1 equipment was restored to normal operation.

At 1957 hours, the Unit 1 - Delco East off-site power source tripped a third time resulting in the same actuations and isolations that occurred at 1949 hours with the exception of the closure of the MSIVs which had been left in the closed position from the previous isolation. During attempts to restore the Unit 1 - Delco East off-site power source, the Unit 1 - Delco East "A" bus 240 KV Control Breaker would not close to allow the plant to accept the incoming Unit 1 - Delco East power. The Brunswick 230 KV electrical system design is such that the Unit 1 - Delco East power source may be supplied to the plant via one of two buses, the Unit 1 - Delco East "A" which is the preferred bus, or the Unit 1 - Delco East "B". To support restoring the third lost power source to Unit 1, the Unit 1 - Delco East "B" bus was selected and the Brunswick Unit 1 - Delco East "B" bus Control Breaker (CB) closed. By 2013 hours, the Unit 1 - Delco East transmission line had been restored and the affected Unit 1 equipment restored to operation.

At 2037 hours, the Unit 1 - Delco East off-site power source tripped a fourth time resulting in the following actuations:

A Unit 1 half Group 1 isolation

A Group 6 isolation resulting in the closure of the Unit 1 CAC valves, isolation of the Unit 1 Reactor Building Ventilation System and a Unit 1 SGTS initiation



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A Half Group 10 isolation resulting in the closure of the Unit 1 Primary Containment Pneumatic Supply Valves - Division I only

A half scram of the Unit 1 RPS logic ("A" logic channel)  
RWCU 1A pump trip

Unit 1 Drywell Purge Isolation

The Unit 1 - Delco East off-site power source was restored through the Unit 1 - Delco East "B" bus at 2155 hours. At 2258 hours, the Unit 1 - Delco East "A" bus was restored following the replacement of a closing auxiliary relay (52X) which had failed at approximately 1957 hours and resulted in the switching of the Unit 1 - Delco East off-site power source to the Unit 1 - Delco East "B" bus. At 2337 hours, based on the return of two of four off-site Unit 1 power sources, the Unusual Event was terminated. The remaining off-site power sources supplied by the Castle Hayne East 230 KV and Jacksonville 230 KV transmission lines were restored at 1309 and 2026 hours on March 14, 1993, respectively.

CAUSE OF EVENT

The Unit 1 and Unit 2 ESF initiations were caused by on-site electrical system voltage fluctuations resulting from the loss of incoming off-site power sources. The voltage fluctuations caused the dropout of various control circuit relays and subsequent spurious operation of ESF equipment.

The loss of the Brunswick Unit 1 - Jacksonville, Castle Hayne East, and Unit 2 - Castle Hayne West 230 KV transmission lines was due to a combination of the forces exerted by severe storm winds and the premature degradation of two Cello-treated wooden poles comprising the H-pole transmission line support structure #10. Inspection of the failed poles revealed that one pole had broken at the groundline and the other had broken approximately two and one-half feet above the groundline. A field inspection of the failure site revealed that the core of each of the failed poles had deteriorated.

The degraded poles were made from Douglas Fir and treated with the wood preservative, Cello. Due to the density of Douglas Fir, Cello may not penetrate the pole completely. Consequently, a Cello-treated Douglas Fir pole may prematurely decay at the core of the pole, especially that part of an installed pole exposed to the moisture levels present at the groundline.

Industry accepted pole inspection techniques include visual examination and solidity testing. To test for solidity the poles are struck with a solid object such as a hammer. The failed poles were last inspected in the Spring of 1992. During that inspection the solidity test was performed and the results indicated that the pole was sound. This is due to the fact that the poles were decayed in the central core of the pole with approximately a one inch thick shell of solid external wood intact. The hard wood external shell prevented detection of the core decay.

The spurious tripping of the Unit 1 - Delco East 230 KV off-site power source is believed to have been caused by debris which was blown into the line due to the high winds. Roofing tin-type materials were discovered near the lines during the storm. Metal debris blown into the line is believed to have caused a flash over which was sensed by the protective relay circuitry and resulted in tripping of the associated Unit 1 - Delco East circuit breakers.

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CORRECTIVE ACTIONS

The Unit 1 - Delco East 230 KV transmission lines have been inspected. No degradation to the line was observed which could have contributed to the loss of this line.

CP&L Transmission Line Design Engineering is reviewing the design of the cross-over points of the transmission lines emanating from CP&L's nuclear plants. Recommended corrective actions will be initiated if needed to prevent recurrence.

The failed Cellon-treated Douglas Fir poles comprising structure #10 were replaced with steel poles.

An inspection of the transmission support structures on each of the eight transmission lines emanating from Brunswick and located within 15 structures from the plant has been performed. Nine Cellon-treated poles were identified. Core samples of some of these nine Cellon-treated poles were taken. Although no significant decay was identified, efforts to replace the Cellon-treated Douglas Fir poles with galvanized steel poles are in progress.

CP&L is currently developing a contract with the Osmose Company to conduct a more thorough inspection of the remaining structures supporting the eight lines emanating from the plant. This inspection is scheduled to begin this year.

SAFETY ASSESSMENT

This event is of minimal safety significance in that total off-site power was not lost and the Emergency Diesel Generators operated as designed. Following each voltage transient, the affected equipment was restored to a normal lineup. During this event the Brunswick electrical distribution system functioned as designed. The protective relays functioned as required to minimize equipment damage. Proper protective device coordination precluded overtripping of equipment. The ESF functioned as designed, including the PPS and the Group Isolation Signals.

PREVIOUS SIMILAR EVENTS

A similar event was reported in LER 2-91-16.

EIIS COMPONENT IDENTIFICATION

<u>System/Component</u>	<u>EIIS Code</u>
Containment Atmospheric Control System	IK
Primary Containment Isolation System	JM
Reactor Protection System	JD
Reactor Water Cleanup System	CE
Standby Gas Treatment System	BH
Switchyard System	FK
Cable/Pole	CBL