



Carolina Power & Light Company

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

July 1, 1992

FILE: B09-13310C

10CFR50.73

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

BRUNSWICK STEAM ELECTRIC PLANT UNIT 1 and 2
DOCKET NO. 50-325 and 50-324
LICENSE NO. DRP-71 and 62
LICENSEE EVENT REPORT 1-92-017

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,

J. W. Spencer for

J. W. Spencer, General Manager
Brunswick Nuclear Project

TMJ/

Enclosure

cc: Mr. S. D. Ebnetter
Mr. R. H. Lo
BSEP NRC Resident Office

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EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION
COLLECTION REQUEST: 60.0 HRS. FORWARD COMMENTS REGARDING BURDEN
ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-630), U.S.
NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, 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 1DOCKET NUMBER (2)
05000325

PAGE (3)

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TITLE (4) INCOMPLETE CLOSURE OF ITE TYPE K-3000 BREAKER CONTACTS

EVENT DATE (5)			LER NUMBER (6)				REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQ. NO.	REV. NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER	
06	01	92	92	-	017	-	00	07	01	92	BSEP 2 05000324

OPERATING MODE (9)	4	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 1.10 Check one or more of the following: (11)									
		20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)						
		20.405(a)(1)(b)	50.36(c)(1)	X	50.73(a)(2)(i)-(v)	73.71(c)					
		20.405(a)(1)(b)	50.36(c)(2)	50.73(a)(2)(vi)	OTHER (Specify in Abstract and Text)						
		20.405(a)(1)(b)	50.73(a)(2)(b)	50.73(a)(2)(viii)(A)							
		20.405(a)(1)(iv)	50.73(a)(2)(b)	50.73(a)(2)(viii)(B)							
POWER LEVEL (10)	00	20.405(a)(1)(iv)	50.73(a)(2)(b)	50.73(a)(2)(ix)							
		20.405(a)(1)(iv)	50.73(a)(2)(b)	50.73(a)(2)(ix)							

LICENSEE CONTACT FOR THIS LER (12)

NAME Theresa M. Jones, Regulatory Compliance Specialist

TELEPHONE NUMBER

(919) 457-2039

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
X	ED	BKR	B455	Y					

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)				DATE (15)	10	15	92
X							

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

Units 1 and 2 were shut down on April 21, 1992 due to seismic concerns. On May 20, 1992, it was discovered that the spring charge/discharge indicator on 480 volt substation breaker E6 indicated "springs charged" after the breaker was closed. This indicated that the main contacts were closed but not exerting full contact pressure against the stationary contacts. This problem had been seen previously on 480 volt substation breaker E7 following adjustments made during a preventive maintenance procedure. Actions taken to correct the problem on E7 were believed to have been adequate; subsequently, these corrective actions were implemented on E6 and E8. When the indication problem resurfaced on E6, it suggested the corrective actions taken on the breakers were not adequate. A subsequent evaluation resulted in all three breakers being declared inoperable. Root cause analysis determined that a human performance problem was involved resulting in the breaker contact pressure being adjusted incorrectly, and an equipment problem was involved in that the breaker lubrication had dried and "gummed" creating increased moving parts resistance. The safety consequences of this event have not been determined. The existing shutdown loading is approximately 900 amps without indications of breaker degradation. Breaker testing is being considered to help determine the safety consequences. A breaker refurbishment program is in progress at BSEP. Two of the involved breakers have been readjusted. The third breaker remains to be adjusted. Compensatory actions are in place. The breakers involved are ABB ITE TYPE K-3000. No previously identified lubrication problems were found at BSEP. An ABB 1989 10CFR21 report did address this issue.

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

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BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH
(P-630), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555,
AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF
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Unit 1****05000325**

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

TITLE**INCOMPLETE CLOSURE OF ITE TYPE K-3000 BREAKER CONTACTS****INITIAL CONDITIONS**

Units 1 and 2 were in COLD SHUTDOWN on April 21, 1992 due to seismic concerns with the diesel generator walls. Preventive maintenance was performed on the Emergency (E) 480 volt substation main breakers (i.e., E5 and E6 for Unit 1; E7 and E8 for Unit 2) in accordance with OPM-BKRO02C, Preventive Maintenance for ITE TYPE K-3000 Circuit Breakers. These circuit breakers supply power to safety related, 480 volt motor control centers (MCC's) for Unit 1 and Unit 2. They are electrically operated, 480 volt 3000 amp breakers with closing springs that fully discharge when the breaker is closed. A "springs charged"/"springs discharged" indicator provides the status of the closing springs. The breaker has two sets of contacts (see ATTACHMENT 1). The "arcing" contacts are sacrificial contacts which close before and open after the "main" contacts to protect the main contacts from wear. Both the arcing and the main contacts close against a set of stationary contacts. The arcing contacts consist of three pairs of contacts each with a "leading" arcing contact (i.e., the contact that first closes against the stationary contact). The breakers also have main contact position indication via a local mechanical flag and remote (i.e., Control Room) indicating lights.

EVENT NARRATIVE**Chronology**

4/30/92 Maintenance personnel commenced OPM-BKRO02C on 480 V Substation E7 Main Breaker, 2-E7-AZ1-52, with two Technical Support personnel observing. Prior to start of the OPM, no closing or indication problems were identified with the breaker. Following OPM contact pressure adjustments, an experienced maintenance individual indicated that the breaker was not completely closed because it did not "sound" like it had closed. Observation of the arcing contacts showed they were not fully depressed against the stationary contacts. The breaker exhibited a "springs charged" indication even though the closing springs appeared to be discharged. The status of the local open/closed indication was not noted.

The breaker was then lubricated and cycled in accordance with the OPM in an attempt to make it close fully. This was not successful.

The breaker vendor, ASEA Brown Boveri (ABB), was called and initially indicated that the problem was most likely due to inadequate lubrication (a "hardening" or absence of grease). The areas where the lubrication problem occurs are not all accessible and the breakers must be sent to the factory to make this determination.

ABB also suggested that there was a possibility the problem might be due to "excessive contact pressure". Technical Support interpreted the vendor's comments to indicate that the leading contact should be backed off to achieve simultaneous closure within 0.032" (see below listed step 7.7.10). To verify this, Technical Support/Maintenance personnel returned to the breaker to reduce the contact pressure.

The OPM steps involved were:

Step 7.7.9 - When the first leading arcing contact just touches, use feeler gauge to measure gaps on other leading arcing contacts.

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Step 7.7.10 - If other leading arcing contacts are not within 0.032" of touching, loosen lock screw and turn adjustment screw for appropriate contacts so that all leading arcing contacts will touch within 0.032".

When the above steps were performed earlier, it was necessary to tighten down (i.e., increase the pressure of) the contacts to obtain 0.032". In order to meet the 0.032" parameter without increasing contact pressure, it was decided to adjust back the first leading arcing contact (the one that had touched first in step 7.7.9). This would allow the contact to touch later in the closing cycle, consequently bringing the other contacts within 0.032" without having to increase (or increase as much) their contact pressure (Step 7.7.10). The adjustment was made and the breaker did close completely; the reduction in contact pressure corrected the closing problem.

The above actions seemed to meet the intent of the OPM procedure and the vendor manual. The OPM states in Step 7.7.10 to "turn adjustment screw for appropriate contacts", consequently this could be interpreted as the first leading arcing contact or the other leading arcing contacts. Also it does not restrict adjustment to either in (increase) or out (decrease). The vendor manual (FP 9527-3664) does distinguish between the first and the other contacts. It states "Adjust the other leading arcing contacts." This was misinterpreted and the OPM was considered sufficient to allow the action taken. Note that adjust could mean increase or decrease contact pressure for the other leading arcing contacts but not for the first leading arcing contact.

4/30 -
5/13/92

The spare breaker had been refurbished by ABB and had not been adjusted by the OPM in the same manner as 2-E7-AZ1-52. It was utilized to replace 1-E5-AU9-52, substation E5 Main Breaker. The OPM was subsequently performed on the breaker removed from 1-E5-AU9-52 as on 2-E7-AZ1-52 (i.e., contact pressure was reduced on the first leading arcing contact).

5/13/92

The breaker 1-E6-AV4-52, substation E6 Main Breaker, was replaced with the recently adjusted breaker from E5. The breaker removed from E6 was then adjusted in the same manner as 2-E7-AZ1-52 and utilized to replace 2-E8-AZ5-52, substation E8 Main Breaker.

5/20/92

During a Technical Support Engineering walkdown, it was discovered that breaker 1-E6-AV4-52 indicated "springs charged" even though it had been cycled to the closed position. This suggested that the corrective action utilized during the 2-E7-AZ1-52 OPM (reduction in contact pressure) was not an effective solution.

ABB was again contacted to discuss the failure of the breaker to completely close. When Technical Support explained to the vendor what had been done, the vendor indicated that the adjustment to reduce contact pressure on the leading arcing contacts may have compromised the contact pressure setting for the main contacts. [Note: The main contact pressure setting was performed in earlier steps in the OPM (steps 7.7.1 and 7.7.2)]. Technical Support was under the impression that the 7.7.1 and 7.7.2 steps were a "gross" setting and that 7.7.9/7.7.10 was the fine tuning. They were not aware/did not understand that steps 7.7.1/7.7.2 were critical and performance of these steps set the minimum desired contact pressure.

5/23/92

Based on the vendor discussion, the possibility existed that the adjustments made may have reduced the main contact pressure to below the minimum pressure allowed by factory specifications. This could prevent the breaker from carrying full rated current (3000 amperes). In addition, the pressure is necessary to keep the

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main contacts closed during a downstream fault. An attempt was made to perform maintenance on the breaker previously removed from unit substation E8. This breaker failed to close completely with the contact pressure set correctly. This breaker was sent to ABB for inspection and root cause determination.

5/29/92 ABB's investigation concluded: The primary cause for the circuit breaker failure to fully close is due to dry and gummed internal parts.

6/1/92 Technical Support Memorandum, TSM 92-5175-0394 documented the issue and LCOs T1-92-760 and A2-92-795 were established, declaring the three breakers (i.e., E6, E7, & E8; E5 was not adjusted improperly) inoperable. WR/JOs were written to readjust the breakers contact pressure to the correct settings:

WR/JO 92-AMPY1	(Complete)	1-E6-AV4-52
WR/JO 92-AMPW1		2-E7-AZ1-52
WR/JO 92-AMPX1	(Complete)	2-E8-AZ5-52

6/5/92 A subsequent recheck of the main contact pressure setting on 1-E6-AV4-52 revealed it was below the minimum allowed by the specification. Compensatory actions for the three breakers were established by TSM 92-5175-0416, requiring verification of complete breaker closure by manually completing the closing cycle.

Investigation

The issue of this type of breaker failing to close had been previously identified in the industry. A 10CFR21 Report from ABB of a problem identified by D. C. Cook was addressed at BSEP by FACTS Item 89B0450 in May 1989. The report identified two breakers which failed to close due to contaminated and dry (hardened and discolored) lubricant. ABB further stated that exposure of circuit breakers to dirty and dusty conditions during plant construction may have contributed to this condition. The breakers that failed at D. C. Cook were approximately the same age as the ones installed at BNP. [Note that the vendor manual does state "the circuit breaker requires no lubrication during its normal service life. However, if the grease should become contaminated or if parts are replaced, any re-lubrication should be done with NO-OX-ID or ANDEROL grease as applicable".]

BNP response to the 10CFR21 Report documented that the breaker preventive maintenance procedures require the breaker to be cleaned and lubricated (if necessary). A review of the breaker type history at BNP did not reveal failures or complications attributable to improper lubrication/contaminants. The location of the breakers (in the Diesel Generator Building, Control Building, Maintenance building basement and a specially designated area of the Turbine Buildings) were identified as extremely clean areas which provide little probability of lubrication contamination. Based on this, it was determined that the condition described in the Part 21 Report did not have a safety impact at BNP and was therefore not applicable.

Two concerns can be identified in the BNP evaluation; 1) the issue over contamination during construction activity was not directly analyzed (particularly since the breakers at BNP were of the same age as those that failed), and 2) reliance on operating history to confirm no problem existed (i.e., no actual checks/inspections were done). Part of the reason for this was probably due to the inability to perform a complete inspection on site (in order to examine all lubricated areas, the breaker has to be disassembled at the factory). Consequently, complete inspections could not be done during the OPM's.

Subsequent to the Part 21 evaluation, the breaker vendor (ABB) issued new maintenance requirements for these breakers which recommend refurbishment (at the factory) every ten years. (BNP breakers are approximately 20 years old). Note that this requirement was not included in the vendors 10CFR21 report. BNP has established and is implementing a breaker

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refurbishment program.

CAUSE OF EVENT

The following factors contributed to the performance problems:

1. The failure to close problem of the breaker was misdiagnosed.
- The failure was attributed to contact pressure instead of inadequate lubrication.
2. Wrong assumptions were made concerning the purpose/function of the breaker adjustments.
- It was not understood that the main contact setting set the minimum contact pressure.
3. There was a lack of specific component knowledge on the breaker.
- No training on operation of breaker was provided.
4. Equipment degradation was not identified prior to its failure/malfunction

The following root causes have been identified:

1. The consequences of potential error were not discussed during the vendor telecon nor before starting work (lack of knowledge and training on the breaker contributed to this).
2. The wording in the OPM is unclear/non-specific.
3. No specific breaker training provided to responsible individuals to provide the bases for the adjustments.
4. Industry operating experience was not effectively used to prevent problems.
5. Preventive maintenance procedures were insufficient to detect problem (factory inspection is also required).

CORRECTIVE ACTIONS

1. Readjust contact pressure on 1-E6-AV4-52, 2-E7-AZ1-52, and 2-E8-AZ5-52.

WR/JO 92-AMPY1 (Complete)

1-E6-AV4-52

WR/JO 92-AMPW1

2-E7-AZ1-52

WR/JO 92-AMPX1 (Complete)

2-E8-AZ5-52

Compensatory actions for the three breakers were established by TSM 92-5175-0416, requiring verification of complete breaker closure by manually completing the closing cycle.

2. Revise OPM-BKR002C to clarify method for contact pressure adjustment.
3. Review other breaker OPMs to determine if revisions are required concerning contact pressure adjustment.
4. Prepare training course on operation/maintenance of breaker types used on site.
5. Review Technical Support training requirements to identify other potential areas concerning component training that require enhancement (possibly in conjunction with the new maintenance training facility).

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6. Continue implementation of breaker refurbishment program. Incorporate ABB's recommendations regarding replacement or refurbishment of ABB K-line breakers.
7. Prior to start-up, review and inspect other critical application breakers to ensure the lubrication problem does not exist (i.e., at a minimum this includes safety related breakers).
8. Prior to start-up, safety related breakers that have not been refurbished/replaced within the last ten years will be refurbished or replaced.
9. By letter dated September 25, 1990, Carolina Power and Light has committed to amend its vendor interface program by December 31, 1992, to include the aspects of GL 90-03 guidance which are not presently included.

SAFETY ASSESSMENT

The safety consequences of this event have not been determined. The existing shutdown loading is approximately 900 amps without indications of breaker degradation. Breaker testing is being considered to help determine the safety consequences.

PREVIOUS SIMILAR EVENTS

No previously identified lubrication problems were found at BNP. The referenced 1989 10CFR21 report did address this issue.

EIIS COMPONENT IDENTIFICATION

<u>System/Component</u>	<u>EIIS Code</u>
480V K-line 3000 Breaker	ED/BKR

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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N-6501, U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545.
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ATTACHMENT 1

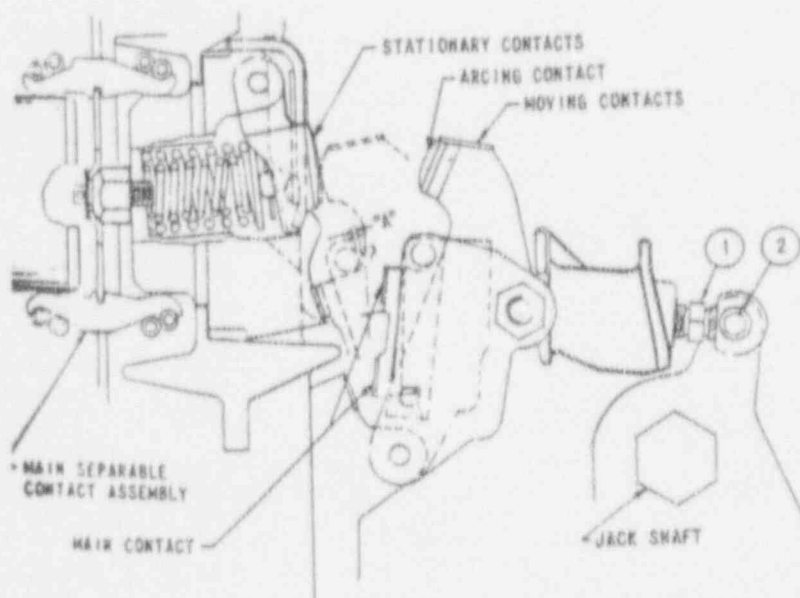


Fig. 3 — Contact Pressure Check and Adjustment