Progress Energy

SEP 2 7 2004

SERIAL: BSEP 04-0106 10 CFR 50.73

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Brunswick Steam Electric Plant, Unit No. 2
Docket No. 50-324/License No. DPR-62
Licensee Event Report 2-04-002

Gentlemen:

In accordance with the Code of Federal Regulations, Title 10, Part 50.73, Carolina Power & Light Company, now doing business as Progress Energy Carolinas, Inc., submits the enclosed Licensee Event Report. This report fulfills the requirement for a written report within sixty (60) days of a reportable occurrence.

Please refer any questions regarding this submittal to Mr. Edward T. O'Neil, Manager – Support Services, at (910) 457-3512.

Sincerely,

David H. Hinds
Plant General Manager
Brunswick Steam Electric Plant

CRE/cre

Enclosure: Licensee Event Report

Progress Energy Carolinas, Inc.
Brunswick Nuclear Plant
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IE22

cc (with enclosure):

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NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES: 06/30/2007

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Brunswick Steam Electric Plant (BSEP), Unit 2	05000324	1 OF 6

4. TITLE
Reactor Shutdown Required by Technical Specifications Due to Containment Vacuum Breaker Not Closed

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
07	29	2004	2004	-- 002 --	00	09	27	2004	FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE	1
10. POWER LEVEL	088

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

20.2201(b)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
20.2201(d)	20.2203(a)(4)	50.73(a)(2)(iii)	50.73(a)(2)(x)
20.2203(a)(1)	50.36(c)(1)(i)(A)	50.73(a)(2)(iv)(A)	73.71(a)(4)
20.2203(a)(2)(i)	50.36(c)(1)(ii)(A)	50.73(a)(2)(v)(A)	73.71(a)(5)
20.2203(a)(2)(ii)	50.36(c)(2)	50.73(a)(2)(v)(B)	OTHER Specify in Abstract below or in NRC Form 366A
20.2203(a)(2)(iii)	50.46(a)(3)(ii)	X 50.73(a)(2)(v)(C)	
20.2203(a)(2)(iv)	X 50.73(a)(2)(i)(A)	X 50.73(a)(2)(v)(D)	
20.2203(a)(2)(v)	50.73(a)(2)(i)(B)	50.73(a)(2)(vii)	
20.2203(a)(2)(vi)	50.73(a)(2)(i)(C)	50.73(a)(2)(viii)(A)	
20.2203(a)(3)(i)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(B)	

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Charles R. Elberfeld, Lead Engineering Technical Support Specialist	(910) 457-2136

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
D	BF	VACB	GPE Controls	Y					

14. SUPPLEMENTAL REPORT EXPECTED			15. EXPECTED SUBMISSION DATE	MO	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X NO				

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

On July 29, 2004, at 0357 hours, with the plant operating at approximately 88 percent of rated thermal power (RTP), one suppression chamber-to-drywell vacuum breaker, opened for testing, would not close. At 1517 hours, operators inserted a manual Reactor Protection System (RPS) trip from 23 percent of RTP. The RPS trip was part of a controlled shutdown required by Technical Specification Limiting Condition for Operation 3.6.1.6 due to the open suppression chamber-to-drywell vacuum breaker.

The vacuum breaker was stuck in the open position due to mechanical interference between a portion of the hinge assembly and a limit switch fit-up bushing on vacuum breaker 2-CAC-X18D. A contributing cause was the sticking of the test actuator in the "open" position. The binding/interference condition was introduced by maintenance activities during the previous refueling outage.

The fit-up bushing was adjusted to eliminate the interference with the hinge assembly and the test actuator was replaced. The remaining nine suppression chamber-to-drywell vacuum breakers on Unit 2, as well as the other ten on Unit 1, were inspected to ensure the same conditions did not exist. The suppression chamber-to-drywell vacuum breaker maintenance procedure is being revised to prevent recurrence. The safety significance of this occurrence is considered to be minimal. This event is being reported in accordance with 10 CFR 50.73 (a)(2)(i)(A) and 10 CFR 50.73(a)(2)(v)(C) and (D).

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* (17)

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

INTRODUCTION

On July 29, 2004, at approximately 0942 hours, the Unit 2 control room operators commenced a reactor shutdown from 88 percent of rated thermal power (RTP) required by Technical Specification (TS) Limiting Condition for Operation (LCO) 3.6.1.6, "Suppression Chamber-to-Drywell Vacuum Breakers," due to an open vacuum breaker [VACB]. At 1214 hours, notification was made to the NRC (i.e., Event Number 40905) in accordance with 10 CFR 50.72(b)(2)(i) for the initiation of a nuclear plant shutdown required by the plant's TS. At 1517 hours, a manual Reactor Protection System (RPS) [JC] trip was inserted to shut down the reactor from approximately 23 percent of RTP. A follow-up notification was made to the NRC Operations Center at 1654 hours to confirm the completed successful shutdown. During this event, all emergency core cooling systems (ECCS), emergency diesel generators, and the reactor core isolation cooling (RCIC) system were operable. This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(A) as the completion of a nuclear plant shutdown required by the plant's TS and 10 CFR 50.73(a)(2)(v)(C) and (D) as a condition that could have prevented the fulfillment of the safety function of structures or systems needed to control the release of radioactive material and mitigate the consequences of an accident.

EVENT DESCRIPTION

On July 29, 2004, at approximately 0351 hours, control room operators authorized testing of suppression chamber-to-drywell [BF] vacuum breakers in accordance with periodic test (0PT-02.3.1) "Suppression Chamber-to-Drywell Vacuum Breakers Operability Test". This test verifies the operability of the ten suppression chamber-to-drywell vacuum breakers in accordance with TS Surveillance Requirement (SR) 3.6.1.6.2, which requires performing a functional test of each required vacuum breaker every 31 days and within 12 hours after any discharge of steam to the suppression chamber from any source. At 0357 hours, the plant entered TS LCO 3.6.1.6 Condition B (i.e., one suppression chamber-to-drywell vacuum breaker not closed) when vacuum breaker 2-CAC-X18D (Manufacturer: GPE Controls, Model No.: LD-240-192) continued to indicate "open" after testing. TS LCO 3.6.1.6 Required Action B.1 states to close the open vacuum breaker within 4 hours. Operators attempted to cycle 2-CAC-X18D, under Senior Reactor Operator direction, and attempted performance of 0PT-02.3.1a, "Suppression Pool to Drywell Vacuum Breaker Position Check (Alternate Method)," which involves the observation of differential pressures between the drywell and suppression pool to verify proper vacuum breaker position, but the vacuum breaker continued to indicate "open." Additional attempts by operators and Instrumentation and Control (I&C) technicians to verify the vacuum breaker position were unsuccessful, and, at 0757 hours, the plant entered TS LCO 3.6.1.6 Condition C. TS LCO Required Actions C.1 and C.2 require the plant to be in Mode 3 (i.e., Hot Shutdown) within 12 hours and to be in Mode 4 (i.e., Cold Shutdown) within 36 hours.

On July 29, 2004, at 0921 hours, operators secured from 0PT-02.3.1a, and at 0942 hours, commenced a reactor shutdown from approximately 88 percent RTP. At approximately 1211 hours, I&C technicians attempted to agitate the test solenoid for vacuum breaker 2-CAC-X18D by varying the voltage and

EVENT DESCRIPTION (continued)

frequency of the electrical power to the solenoid. The attempt was unsuccessful at closing the vacuum breaker. Operators continued to reduce reactor power and, at 1517 hours, operators inserted a manual RPS trip to shut down the reactor from approximately 23 percent RTP.

All control rods fully inserted into the core and no ECCS/RCIC actuations or safety relief valve lifts occurred. Following the scram, an expected reactor vessel coolant level shrink occurred, causing coolant level to decrease below the Low Level 1 setpoint. This coolant level decrease resulted in a Primary Containment Isolation System (PCIS) isolation signal to Group 2 (i.e., Drywell Equipment and Floor Drain, Traversing In-core Probe, Residual Heat Removal (RHR) Discharge to Radwaste, and RHR Process Sample) primary containment isolation valves (PCIVs), Group 6 (i.e., Containment Atmosphere Control/Dilution, Containment Atmosphere Monitoring, and Post Accident Sampling System) PCIVs, and Group 8 (i.e., RHR Shutdown Cooling Suction and RHR Inboard Injection) PCIVs. The isolation signal closed all of the PCIVs that were open at the time of the expected actuation. On July 30, 2004, at approximately 0025 hours, the plant entered Mode 4.

EVENT CAUSE

The cause of the event is attributed to mechanical interference between a portion of the hinge assembly, which actuates an "open" position indicating limit switch, and the fit-up bushing (i.e., listed in the vendor manual as a retaining ring) that houses the limit switch. A contributing cause was the sticking of the test actuator for 2-CAC-X18D in the "open" position.

After the plant was shut down, the suppression chamber was accessed and vacuum breaker 2-CAC-X18D was inspected. Engineering and maintenance personnel found 2-CAC-X18D fully open with the pneumatic test actuator in the extended (i.e., open) position. When operations attempted to cycle 2-CAC-X18D with the investigators present, the actuator, which utilizes pressurized nitrogen to extend and spring to retract, moved only approximately one eighth of an inch, and the vacuum breaker remained open. Actions to ensure that the test actuator was being properly vented, when the vacuum breaker test switch was taken to the "closed" position, did not result in the vacuum breaker closing. Investigating personnel then reached inside the vacuum breaker and attempted to move the pallet side-to-side in an effort to determine if the hinge assembly was bound. Although the pallet could not be moved in the side-to-side direction, when it was released, the pallet and actuator arm swung closed as the test actuator returned to the retracted position. Additional testing of the vacuum breaker demonstrated that the sticking open condition was repeatable but not consistent. Further evaluation also demonstrated that the pallet would stick open without the additional support of the test actuator (i.e., with the test actuator retracted). Visual inspection from inside the vacuum breaker identified mechanical interference between the "open" limit switch fit-up bushing and the portion of the hinge assembly, which actuates the limit switch. The mechanical interference occurred when the vacuum breaker was at or near the full "open" position and would cause the vacuum breaker to stick open.

Inspection of the disassembled test actuator indicated uncharacteristic wear corresponding to the area where the actuator was found sticking. This wear came from side loading on the actuator piston caused by binding

EVENT CAUSE (continued)

of the pallet assembly in the last few degrees of stroke to the "open" position (i.e., the binding of the pallet assembly hinge caused the abnormal loading and wear on the actuator).

The root cause of the condition is attributed to insufficient procedural detail and guidance. None of the maintenance or test procedures applicable to the vacuum breakers contained adequate guidance to address potential binding when adjusting the vacuum breaker hinges or the "open" limit switches. No cautions pertaining to potential interference were provided in the procedures or vendor manual and no checks were provided after adjustment of the components. Vacuum breaker 2-CAC-X18D was disassembled, inspected, and reassembled, along with four other vacuum breakers during the spring 2003, refueling outage. This was most likely the time that the interference condition was introduced.

A contributing cause identified during the investigation was that the suppression chamber-to-drywell vacuum breaker test actuators did not have any preventive maintenance tasks established for the periodic maintenance of the components.

CORRECTIVE ACTIONS

For vacuum breaker 2-CAC-X18D, the "open" limit switch, whose fit-up bushing was causing interference, was replaced and the fit-up bushing was properly adjusted to preclude any further interference with the hinge. Additionally, the test actuator was replaced, and 2-CAC-X18D was retested satisfactorily in accordance with plant procedures. The remaining nine suppression chamber-to-drywell vacuum breakers were inspected and no other conditions of interference between the "open" limit switch fit-up bushings and the vacuum breaker hinge assemblies were identified.

Although the remaining nine vacuum breakers were stroke tested and had acceptable results, two additional conditions were identified with test actuators. For vacuum breaker 2-CAC-X18F, the test actuator was found to have an approximate ten second retraction time as compared to the two to three second stroke time observed for the other actuators. The governor/control valve was replaced and a normal stroke time was restored. For vacuum breaker 2-CAC-X18H, the test actuator cylinder was observed leaking through a crack in the cylinder wall. The test actuator was replaced. Both vacuum breakers were retested satisfactorily in accordance with plant procedures. Neither of these as-found conditions adversely affected vacuum breaker operability.

Due to the interference condition found on the Unit 2 vacuum breaker, consideration was given to the possibility of the same condition existing on Unit 1 suppression chamber-to-drywell vacuum breakers. 0PT-02.3.1 was revised to include provisions for recording "open" and "closed" stroke time data to trend actuator/vacuum breaker performance. The ten Unit 1 suppression chamber-to-drywell vacuum breakers were tested in accordance with 0PT-02.3.1 and were found to be performing satisfactorily. On August 15, 2004, with Unit 1 shutdown due to Hurricane Charley, engineering and maintenance personnel entered the suppression chamber to inspect and test the vacuum breakers. Visual inspection of the internals of the ten vacuum breakers found no conditions of interference between "open" limit switch fit-up bushings and the vacuum breaker hinge assemblies. Each vacuum breaker was stroked from the control room while being

CORRECTIVE ACTIONS (continued)

observed locally. All ten vacuum breakers stroked satisfactorily and smoothly; although vacuum breaker 1CAC-X18C had one non-repeatable "open" stroke time of 6.74 seconds. As a precautionary measure, the governor/control valve was replaced, and the vacuum breaker was retested satisfactorily.

Appropriate preventive maintenance activities for the suppression chamber-to-drywell vacuum breaker test actuators are being developed. Implementation of the activities will begin during the next refueling outage for each unit.

To prevent recurrence of this event, Preventive Maintenance procedure (0PM-VBR500), "GPE/Singer Vacuum Breakers, Models LD-240-192 and 193 Inspection," is being revised to include provisions to:

1. Check for hinge/fit-up bushing binding whenever a disassembly inspection is performed.
2. Perform a more thorough post-test examination of the vacuum breakers and test actuators to detect and address erratic stroking, binding, and cylinder leaks.
3. Rebuild the test actuators at a set frequency.
4. Adjust "open" limit switches and caution personnel relative to possible interference problems if an adjustment is performed.

The revision to 0PM-VBR500 will be effective by December 1, 2004.

SAFETY ASSESSMENT

The safety significance of this occurrence is considered minimal. The function of the suppression chamber-to-drywell vacuum breakers is to relieve vacuum in the drywell. There are 10 internal vacuum breakers located on the vent header between the drywell and the suppression chamber, which allow flow from the suppression chamber atmosphere to the drywell when the drywell is at a negative pressure with respect to the suppression chamber. Each vacuum breaker is self actuating, similar to a check valve, and can be remotely operated for testing purposes. The safety analyses assume that these vacuum breakers are closed initially. With one vacuum breaker not closed, communication between the drywell and suppression chamber airspace could occur, and as a result, there is the potential for primary containment over pressurization due to this bypass leakage if a loss of coolant accident (LOCA) were to occur. A short time is allowed to close the vacuum breaker due to the low probability of an event that would pressurize primary containment.

The vacuum breaker 2-CAC-X18D was open in Mode 1 for approximately 11 hours and 40 minutes, and in Mode 3 for approximately 9 hours and 8 minutes. For these periods of time for which the vacuum breaker is required to be closed, it is conservatively assumed that the safety function of containment was lost. This assumption is considered to be conservative because only minimal mechanical agitation was applied to allow the pallet to swing closed. Accident conditions would likely result in mechanical agitation greater than that required to free the pallet. During the times that the vacuum breaker was open and required to be closed, operators were aware of the condition and were in compliance with the TS LCO 3.6.1.6 Required Actions to attempt to close the vacuum breaker and shut down the plant.

SAFETY ASSESSMENT (continued)

The condition that led to the vacuum breaker being stuck in the open position was most likely introduced during the spring 2003, refueling outage, when preventive maintenance was performed, which included disassembly of the pallet/hinge and replacement of the eccentric hinge bushings. Analyses postulating 2-CAC-X18D being initially closed and sticking open during either a large-break or small-break LOCA conclude that the safety function of primary containment would be maintained.

PREVIOUS SIMILAR EVENTS

A review of events occurring within the past three years has not identified any previous similar occurrences.

COMMITMENTS

Those actions committed to by Progress Energy Carolinas, Inc. (PEC) in this document are identified below. Any other actions discussed in this submittal represent intended or planned actions by PEC. They are described for the NRC's information and are not regulatory commitments. Please notify the Manager – Support Services at BSEP of any questions regarding this document or any associated regulatory commitments.

To prevent recurrence of this event, 0PM-VBR500 is being revised to include provisions to:

1. Check for hinge/fit-up bushing binding whenever a disassembly inspection is performed.
2. Perform a more thorough post-test examination of the vacuum breakers and test actuators to detect and address erratic stroking, binding, and cylinder leaks.
3. Rebuild the test actuators at a set frequency.
4. Adjust "open" limit switches and caution personnel relative to possible interference problems if an adjustment is performed.

The revision to 0PM-VBR500 will be effective by December 1, 2004.