Progress Energy

January 7, 2009

SERIAL: BSEP 08-0161

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 2-2008-002

Ladies and 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. Gene Atkinson, Supervisor - Licensing/Regulatory Programs, at (910) 457-2056.

Sincerely,

Edward L. Wills, Jr.
Plant General Manager
Brunswick Steam Electric Plant

LJG/ljg

Enclosure:

Licensee Event Report

Progress Energy Carolinas, Inc.
Brunswick Nuclear Plant
PO Box 10429
Southport, NC 28461

IE22
NRR

cc (with enclosure):

U. S. Nuclear Regulatory Commission, Region II
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NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 08/31/2010
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)	Estimated burden per response to comply with this mandatory collection request: 80 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 Service 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.

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE
Manual Reactor Scram Due to Spurious Safety Relief Valve Opening

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER 05000
11	09	2008	2008	-- 002 --	00	01	07	2009	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE: 1

10. POWER LEVEL: 100

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

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

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Lee J. Grzeck, Senior Engineer – Licensing	(910) 457-2487

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

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

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

On November 9, 2008, at 1108 hours Eastern Standard Time (EST), Safety Relief Valve (SRV) 2-B21-F013H (i.e., SRV H) spuriously opened with no Operator action or testing in progress. The SRV's control switch was cycled as required by Abnormal Operating Procedure with no success. At 1113 hours, the fuses were pulled for SRV H in an attempt to close the valve. At 1117 hours, a manual reactor scram was inserted based on the Suppression Pool temperature reaching 109.8 degrees Fahrenheit (F). Technical Specifications requires a manual reactor scram to be inserted when Suppression Pool average temperature exceeds 110 degrees F. All control rods fully inserted from the manual reactor scram signal. Reactor water level lowered to Low Level 2 resulting in Primary Containment Isolation System (PCIS) isolations of Groups 2, 3, 6, and 8. In addition, the Reactor Core Isolation Cooling (RCIC) system actuated and injected into the reactor. The High Pressure Coolant Injection (HPCI) system actuated but did not inject since reactor water level had recovered. An Alternate Rod Insertion signal was received, the Standby Gas Treatment (SBGT) system initiated, and the Reactor Recirculation pumps tripped as designed. All systems responded as designed.

The root cause of this event was the failure to verify proper seating of the set pressure spring in the upper spring follower plate. The corrective action to prevent recurrence is to revise the corrective maintenance procedure to perform verification of proper set pressure spring seating prior to the reassembly of the pilot valve.

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NARRATIVE

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

INTRODUCTION

On November 9, 2008, at 1108 hours Eastern Standard Time (EST), Safety Relief Valve (SRV) 2-B21-F013H [SB] spuriously opened with no Operator action or testing in progress. The SRV's control switch was cycled as required by Abnormal Operating Procedure with no success. At 1113 hours the fuses were pulled for SRV H in an attempt to close the valve. At 1117 hours, a manual reactor scram was inserted based on the Suppression Pool temperature reaching 109.8 degrees Fahrenheit (F). Technical Specifications requires a manual reactor scram to be inserted when Suppression Pool average temperature exceeds 110 degrees F. All control rods fully inserted from the manual reactor scram signal. Reactor water level lowered to Low Level 2 resulting in Primary Containment Isolation System (PCIS) [JM] isolations of Groups 2, 3, 6, and 8. In addition, the Reactor Core Isolation Cooling (RCIC) [BN] system actuated and injected into the reactor. The High Pressure Coolant Injection (HPCI) [BJ] system actuated but did not inject since reactor water level had recovered. An Alternate Rod Insertion [JC] signal was received, the Standby Gas Treatment (SBGT) [BH] system initiated, and the Reactor Recirculation [AD] pumps tripped as designed. All systems responded as designed.

At 1208 hours (EST) on November 9, 2008, the NRC was notified of this event (i.e., Event Number 44647) in accordance with 10 CFR 50.72(b)(2)(iv)(B), as an event or condition that results in actuation of the reactor protection system (RPS) [JC] when the reactor is critical, and 10 CFR 50.72(b)(3)(iv)(A), as an event or condition that results in valid actuation of any of the systems listed in 10 CFR 50.72(b)(3)(iv)(B).

This event is being reported in accordance with 10 CFR 50.73(a)(2)(iv)(A), as an event or condition that resulted in manual or automatic actuation of any of the systems listed in 10 CFR 50.73(a)(2)(iv)(B).

EVENT DESCRIPTION

Initial Conditions

Prior to the event, Unit 2 was in Mode 1 operating at approximately 100 percent rated thermal power.

Discussion

On November 9, 2008, at 1108 hours with Unit 2 at 100 percent reactor power under steady state operation and with no testing in progress, the control room noted an open indication for Safety Relief Valve (SRV) 2-B21-F013H (i.e., SRV H). Annunciator "2-A-3 1-10 SRV Open" was received and an open indication was observed for SRV H. This was closely followed by annunciator "2-A-3 1-1 SRV Leaking" and observations of decreasing reactor power. The suppression pool high level alarm was received and 0AOP-30.0, "Safety/Relief Valve Failures," was entered. The Control Room (CR) Reactor Operator cycled the SRV H control switch three times in an attempt to close the valve. No change in SRV H indication occurred. At 1110 hours, in response to an increase in reactor power, the CR Senior Reactor Operator (SRO) directed

NARRATIVE

EVENT DESCRIPTION (continued)

the reactor power to be reduced to 98 percent using Reactor Recirculation Pump flow. At 1113 hours, in accordance with 0AOP-30.0, the fuses were pulled for SRV H in an attempt to close the valve. Approximately four minutes later, at 1117 hours, with the Suppression Pool average temperature reaching 109.8 degrees F, a manual reactor scram was inserted. Technical Specification 3.6.2.1, "Suppression Pool Average Temperature," requires a manual reactor scram to be inserted when Suppression Pool average temperature exceeds 110 degrees F. All control rods fully inserted from the manual reactor scram signal.

Post-event review determined that pulling the fuses did not result in closure of SRV H, and that it was still open when the manual scram was inserted, and remained open for approximately two more seconds. When the reactor scram was inserted, reactor pressure dropped below the required reseat pressure for the SRV pilot and the valve closed.

The purpose of the Main Steam system at BSEP is to provide high quality steam from the Reactor Pressure Vessel (RPV) to various steam driven components. To protect the RPV from overpressure transients, SRVs are located on the four main steam lines, between the RPV and the inboard Main Steam Isolation Valves, to prevent vessel overpressurization. There are a total of 11 SRVs on the main steam lines. Three different set pressures are used for the SRVs with a certain number of the 11 SRVs set at each set pressure. Under normal plant operation, none of the SRVs should lift. Each of the SRVs discharge into a tailpipe which directs the effluent to an underwater "T quencher" located near the bottom of the suppression pool, where the steam is condensed. Leakage on an SRV tailpipe is monitored by SRV tailpipe temperatures. The SRV H tailpipe did not have any indications of leakage prior to the event and exhibited no warning signs prior to the valve spuriously opening.

The SRVs at BSEP are Target Rock two stage pilot-operated safety relief valves consisting of two principle assemblies: a pilot stage assembly and the main stage assembly. These two assemblies are directly coupled to provide a unitized, dual function safety relief valve. The pilot stage assembly is the pressure-sensing and control element, and the main stage assembly is a system fluid-actuated follower valve which provides the pressure relief function. Self-actuation of the pilot assembly at its set pressure vents the main piston chamber, permitting the system pressure to fully open the main assembly, which results in system depressurization.

Post-event testing of SRV H pilot stage assembly was performed at Wyle Labs, with assistance from BSEP Engineering and Maintenance personnel. The SRV H pilot stage assembly was disassembled and inspected. The inspection determined there was no significant damage to the pilot, but rub marks and scoring were found between the top of the spring and spring follower, on the bellows rod adjacent to the guide plate, and inside of the pilot disk. The clearance between the bottom of the spring and the bottom spring retainer was found to be excessive and the spring was found 42 mils off-center. No significant steam cutting was noted on the disk and no FME was observed in the pilot. The set pressure adjusting nut was found to be secure and the tab locks were properly installed. The spring was tested and the spring height and spring constant were found to be within tolerance.

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EVENT DESCRIPTION (continued)

The spring assembly, pilot disk, and bellows assembly were then shipped to Progress Energy's Harris Environmental and Energy (HE&E) Center for further investigation. HE&E Center verified excessive clearance between the bottom of the spring and the bottom spring retainer. Per Target Rock, the design diametric clearance is 25 +/-5 mils. The as-found clearance was noted to be approximately 60 mils. Further investigation found indications of rub marks and light scratching on the top of the spring and the spring follower plate. The locations of these marks indicated that the top of the spring was sitting on the ledge of the spring follower plate, and not seated properly on the spring follower plate. Additional supporting evidence was found that the spring was incorrectly installed, including galling on the bellows rod to the guide plate fit, and a spot in the end of the bellows rod, which seats in the pilot disc, that matched a similar off-center spot inside the pilot disc. These spots can be explained by off-center loading of the spring. Additionally, significant ditching was noted on the pilot disc. The location of the ditching corresponds with the location of the spots between the bellows rod and pilot disc. Additional testing on the pilot was then performed at Wyle Labs with the spring positioned on the ledge of the spring follower, and again with the spring properly centered on the spring follower plate. Set pressure change was found to be approximately 100 psi as a result of the change in the spring position.

With the set pressure spring improperly positioned on the ledge of the spring follower plate, it is believed that on November 9, 2008, the spring slipped off of the spring follower ledge and into its proper position on the spring follower plate. This movement decompressed the set pressure spring, effectively lowering the set pressure of the pilot by approximately 100 psi, which then resulted in the opening of SRV H.

EVENT CAUSE

The root cause of this event was the failure to verify proper seating of the set pressure spring in the upper spring follower plate. The set pressure spring was installed with part of the spring sitting on the ledge of the upper spring follower plate, which actually compressed the spring more than it would when properly installed. The SRV H pilot stage assembly was then certified with the spring incorrectly positioned on the ledge. The BSEP corrective maintenance procedure, 0CM-VSR509, "Main Steam Relief Valves Target Rock Model 7567 Air Operators and Pilot Assembly Disassembly, Inspection, and Reassembly," did not provide guidance to check or verify that the spring is properly installed. It should be noted that prior to 2000, Target Rock performed rebuilds of BSEP's SRV pilot stage assemblies. In mid-2000, BSEP Maintenance began performing the rebuilds of the SRV pilot stage assemblies.

SAFETY ASSESSMENT

The safety significance of this condition is considered minimal. The plant is designed for this type of event and responded as expected for this condition. All safety system actuations functioned as designed and Operations personnel responded appropriately in accordance with procedures.

LICENSEE EVENT REPORT (LER)
Continuation Sheet

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CORRECTIVE ACTIONS

The following corrective action to prevent recurrence will be taken:

- 0CM-VSR509, "Main Steam Relief Valves Target Rock Model 7567 Air Operators and Pilot Assembly Disassembly, Inspection, and Reassembly," will be revised to provide steps to perform verification of proper set pressure spring seating prior to reassembly of pilot valve. This action is currently scheduled to be completed by June 1, 2009.

Additional corrective actions include the following:

- All 11 SRV pilot stage assemblies in Unit 2 were replaced following this scram event with certified spares containing new spring assemblies. Based on review of certification test data, high-confidence exists that the springs in these valves are properly installed. This action is complete.
- The Corporate valve component Engineer performed an assessment of SRV pilot stage assembly certification data for all SRV pilots currently installed in both Unit 1 and Unit 2, and verified, based on existing data, that an improperly installed spring does not exist in the plant. This action is complete.

PREVIOUS SIMILAR EVENTS

A review of LERs and corrective action program condition reports for the past three years did not identify any similar previous occurrences.

COMMITMENTS

No regulatory commitments are contained in this report.