Progress Energy

JUN 2 2 2009

SERIAL: BSEP 09-0063 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 2-2007-002, Supplement 1

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 supplement to Licensee Event Report (LER) 2-2007-002, dated June 18, 2007 (i.e., Accession Number ML071770130). This supplement revises the root cause and corrective actions to prevent recurrence associated with this event.

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

MAT/mat

Enclosure:

Licensee Event Report

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Brunswick Nuclear Plant
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IE22
NRR

cc (with enclosure):

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NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2010

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.

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 5

4. TITLE

Mode Change Made with Reactor Core Isolation Cooling System Inoperable

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
04	17	2007	2007	– 002 –	01	06	22	2009	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE

2

10. POWER LEVEL

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11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

☐ 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
☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Mark Turkal, Lead Engineer - Licensing	(910) 457-3066

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

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On April 16, 2007, at approximately 1300 hours (EDT), Unit 2 achieved a reactor steam dome pressure of greater than 150 psig in Mode 2 (i.e., the Applicability of Technical Specification (TS) 3.5.3, "RCIC System") following startup from a refueling outage which began on March 3, 2007. Subsequently, on April 18, 2007, the Reactor Core Isolation Cooling (RCIC) system was declared inoperable. It has been determined that RCIC was inoperable when the Applicability of Technical Specification (TS) 3.5.3, "RCIC System," was entered. Limiting Condition for Operation (LCO) 3.0.4 prohibits entry into a mode or other specified condition in the applicability unless, subject to certain exceptions, the LCO is met. As such, restart of Unit 2 with RCIC inoperable is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as operation prohibited by the plant's TSs.

The root cause of this event was the lack of a time delay relay on the low suction pressure switch; increasing the likelihood that the RCIC system would trip due to small pressure perturbations, combined with a section of RCIC injection piping which was sloped incorrectly and, as a result, contained air voiding. Air voids were introduced as a result of system maintenance and inspection performed during the refueling outage. These voids, which collapsed as a result of starting RCIC, introduced a pressure wave of sufficient magnitude to actuate the RCIC low suction pressure trip logic but not sufficient to cause a water hammer large enough to result in physical damage to affected components. The corrective actions to prevent recurrence consisted of installation of time delay relays to eliminate spurious trips due to momentary pressure oscillations and modification of the injection piping to resolve the air voiding concerns.

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Brunswick Steam Electric Plant (BSEP), Unit 2	05000324	2007 --	002 --	01	2 of 5

NARRATIVE

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

Introduction

Initial Conditions

At the time of this event, Unit 2 was in the process of startup following a refueling outage which started on March 3, 2007. The Reactor Core Isolation Cooling (RCIC) system [BN] was believed to be operable; however, Surveillance Requirements (SRs) 3.5.3.4 and 3.5.3.3 (i.e., the low and high pressure RCIC system testing, respectively) had not yet been completed since the required reactor pressures had not yet been achieved. All other emergency core cooling systems were operable when the Applicability for TS 3.5.3, "RCIC System," was entered.

Reportability Criteria

The Limiting Condition for Operation (LCO) for TS 3.5.3 requires that RCIC be operable. The Applicability for TS 3.5.3 is Mode 1 and Modes 2 and 3 with reactor steam dome pressure greater than 150 psig. LCO 3.0.4 prohibits entry into a mode or other specified condition in the applicability unless, subject to certain exceptions, the LCO is met. It has been determined that the RCIC system was not operable when the Applicability for TS 3.5.3 was entered on April 16, 2007. This condition is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as operation prohibited by the plant's TSs.

Event Description

The Applicability for TS 3.5.3 is Mode 1 and Modes 2 and 3 with reactor steam dome pressure greater than 150 psig. Unit 2 entered Mode 2 at approximately 2250 hours Eastern Daylight Time (EDT) on April 15, 2007, and achieved a reactor steam dome pressure of 150 psig at approximately 1300 hours on April 16, 2007. At approximately 1350 hours on April 16, 2007, during performance of SR 3.5.3.4 (i.e., the low pressure RCIC surveillance), RCIC was declared inoperable due to oil leaking from the west RCIC lube oil duplex oil strainer. Additionally, the RCIC barometric condenser vacuum pump did not function properly; however, this did not impact the operability of RCIC.

SR 3.5.3.4 was re-performed at approximately 1822 hours on April 16, 2007, and the west RCIC lube oil duplex oil strainer was leaking. The surveillance was completed unsatisfactorily, TSs met, since RCIC was able to develop the required flowrate. Based on an engineering review, it was determined that RCIC was operable provided the duplex strainer was selected to the east strainer. The RCIC system was declared operable at approximately 0330 hours on April 17, 2007.

Unit 2 continued startup and entered Mode 1 at approximately 1813 hours on April 17, 2007. This required completion of SR 3.5.3.3 (i.e., the high pressure RCIC surveillance) by 1813 hours on April 18, 2007. At approximately 1217 hours on April 18, 2007, RCIC tripped during performance of SR 3.5.3.3. It was

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Brunswick Steam Electric Plant (BSEP), Unit 2	05000324	2007 --	002 --	01	3 of 5

NARRATIVE

Event Description (continued)

believed that the trip was due to an overspeed condition caused by air in the lube oil system. RCIC was manually restarted, in accordance with plant procedures, to purge air from the lube oil system. Prior to performing the manual RCIC start, it was noted that the RCIC trip light at the Remote Shutdown Panel was illuminated. This trip light will illuminate in the event of: (1) overspeed, (2) low suction pressure, or (3) high turbine exhaust diaphragm pressure. Following the manual start, at approximately 1559 hours on April 18, 2007, SR 3.5.3.3 was completed satisfactorily and RCIC was declared operable.

Based upon further investigations, discussions with operations personnel, and review of computer data, it was determined that the RCIC trip which occurred during performance of SR 3.5.3.3 on April 18, 2007, was not due to overspeed and that the only signal capable of illuminating the trip light under the test circumstances was low suction pressure, because no overspeed trip or exhaust diaphragm rupture occurred. The low suction pressure trip occurs when the low suction pressure switch 2-E51-PSL-N006 senses 15 inches HG vacuum. As a result of this determination, RCIC was declared inoperable at approximately 1930 hours on April 19, 2007.

Troubleshooting activities were initiated and several RCIC data collection runs performed. During these runs it was determined that the April 18, 2007, RCIC trip and a subsequent April 20, 2007, RCIC trip were due to sensed low suction pressure. On April 24, 2007, a subsequent RCIC run showed that the turbine suction pressure was oscillating between the high and low suction pressure setpoints. These oscillations only occurred for a few seconds during RCIC startup. Engineering determined that the oscillations were a result of air voids in the injection piping which collapsed as a result of starting RCIC. The void collapse introduced a pressure wave of sufficient magnitude to actuate the RCIC low suction pressure trip logic but not sufficient to cause a water hammer large enough to result in physical damage to affected components. This piping has improper sloping and, therefore, venting during RCIC system restoration following work performed during the refueling outage did not completely remove the voids.

A temporary modification installed a pressure snubber upstream of the 2-E51-PSL-N006 low suction pressure switch to dampen suction pressure oscillations. RCIC was returned to operable status at 0250 hours on April 28, 2007.

Event Cause

The root cause of this event was the lack of a time delay relay on the 2-E51-PSL-N006 RCIC low suction pressure switch combined with the improper sloping of the 25-foot section of injection piping which contained air voiding introduced during the 2007 refueling outage.

The lack of a time delay relay made the RCIC system more sensitive to small pressure perturbations. Industry benchmarking indicates that a time delay relay for the RCIC low suction pressure switch is a typical design feature employed to guard against spurious trips.

NARRATIVE

Event Cause (continued)

Injection pipe sloping has not changed since initial plant construction. A review of historical, Unit 2 test runs has identified similar flow responses, but to a lesser degree. There is no historical evidence of RCIC turbine trips as a result of void induced pressure waves. Historical system performance provides assurance that even though voiding due to pipe sloping has always been present to some extent, it has not affected system operability. A walkdown of the Unit 1 RCIC injection piping was performed and no sloping inaccuracies were identified.

Safety Assessment

The safety significance of this condition is considered minimal.

The RCIC system is not an Engineered Safety Feature system and no credit is taken in the safety analyses for RCIC system operation. RCIC provides adequate core cooling to prevent the reactor fuel from overheating in the event of reactor isolation accompanied by a loss of feedwater flow. The system provides core cooling following a reactor shutdown by maintaining sufficient reactor water inventory until the reactor is depressurized to a level where the shutdown cooling system can be placed in operation. RCIC's function to operate automatically to maintain sufficient coolant in the reactor vessel to prevent overheating of the reactor fuel, in the event of reactor isolation accompanied by loss of feedwater flow, is a transient response function and not a safety-related function.

Although RCIC was inoperable for automatic injection due to the low suction pressure trips, it was available for injection using plant procedure 2OP-16, "Reactor Core Isolation Cooling Operating Procedure." Therefore, RCIC was available to perform its design functions.

The potential magnitude of the pressure wave induced by air void collapse in the RCIC injection piping would not be sufficient to cause a water hammer large enough to result in physical damage to affected components.

Corrective Actions

The following immediate corrective actions were completed.

- A temporary modification installed a pressure snubber upstream of the 2-E51-PSL-N006 low suction pressure switch to dampen suction pressure oscillations.
- Filling and venting of the Unit 2 RCIC system injection piping, using 65 psig keep fill pressure with the bypass valve throttled open, was performed in accordance with plant procedure 2OP-16 to ensure the elimination of air voiding.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Brunswick Steam Electric Plant (BSEP), Unit 2	05000324	2007 --	002 --	01	5 of 5

NARRATIVE

Corrective Actions (continued)

The following corrective actions to prevent recurrence were established as a result of this event.

- Time delay relays were added to the Unit 1 and Unit 2 E51-PSL-N006 low suction pressure switches to prevent spurious trips due to momentary pressure oscillations.
- The improper Unit 2 RCIC injection piping slope has been corrected.

Previous Similar Events

A review of LERs and corrective action program condition reports for the past three years identified no similar events.

Commitments

No regulatory commitments are contained in this report.