



Progress Energy

SEP 30 2005

SERIAL: BSEP 05-0127

10 CFR 50.73

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

**Subject: Brunswick Steam Electric Plant, Unit Nos. 1 and 2
Docket Nos. 50-325 and 50-324/License Nos. DPR-71 and DPR-62
Voluntary Licensee Event Report 1-2005-006**

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 Voluntary Licensee Event Report.

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

Sincerely,

**B. C. Waldrep
Plant General Manager
Brunswick Steam Electric Plant**

MAT/mat

Enclosure:

Voluntary Licensee Event Report

**Progress Energy Carolinas, Inc.
Brunswick Nuclear Plant
P.O. Box 10429
Southport, NC 28461**

IE22

cc (with enclosure):

U. S. Nuclear Regulatory Commission, Region II
ATTN: Dr. William D. Travers, Regional Administrator
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, GA 30303-8931

U. S. Nuclear Regulatory Commission
ATTN: Mr. Eugene M. DiPaolo, NRC Senior Resident Inspector
8470 River Road
Southport, NC 28461-8869

U. S. Nuclear Regulatory Commission
ATTN: Ms. Brenda L. Mozafari (Mail Stop OWFN 8G9) **(Electronic Copy Only)**
11555 Rockville Pike
Rockville, MD 20852-2738

Ms. Jo A. Sanford
Chair - North Carolina Utilities Commission
P.O. Box 29510
Raleigh, NC 27626-051

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|--|--------|---|---------------|--|------------------------------|
| NRC FORM 366 (6-2004) | | U.S. NUCLEAR REGULATORY COMMISSION | | APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2007 <small>Estimated burden per response to comply with this mandatory information 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 Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollect@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.</small> | |
| LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block) | | | | | |
| 1. FACILITY NAME Brunswick Steam Electric Plant (BSEP), Unit 1 | | | | 2. DOCKET NUMBER 05000325 | |
| 3. PAGE 1 OF 5 | | | | | |
| 4. TITLE Voluntary Report - Shutdown of Units 1 and 2 Due to Emergency Diesel Generator Operability Concerns | | | | | |
| 5. EVENT DATE | | 6. LER NUMBER | | 7. REPORT DATE | |
| MONTH | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REV NO |
| 08 | 06 | 2005 | 2005 | -- 006 -- | 00 |
| | | | | MONTH | DAY |
| | | | | 09 | 30 |
| | | | | YEAR | |
| | | | | 2005 | |
| 8. OTHER FACILITIES INVOLVED | | | | | |
| FACILITY NAME | | | | DOCKET NUMBER | |
| BSEP, Unit 2 | | | | 05000324 | |
| FACILITY NAME | | | | DOCKET NUMBER | |
| | | | | 05000 | |
| 9. OPERATING MODE | | 11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) | | | |
| 1 | | <input type="checkbox"/> 20.2201(b) <input type="checkbox"/> 20.2203(a)(3)(i) <input type="checkbox"/> 50.73(a)(2)(i)(C) <input type="checkbox"/> 50.73(a)(2)(vii) | | | |
| | | <input type="checkbox"/> 20.2201(d) <input type="checkbox"/> 20.2203(a)(3)(ii) <input type="checkbox"/> 50.73(a)(2)(ii)(A) <input type="checkbox"/> 50.73(a)(2)(viii)(A) | | | |
| | | <input type="checkbox"/> 20.2203(a)(1) <input type="checkbox"/> 20.2203(a)(4) <input type="checkbox"/> 50.73(a)(2)(ii)(B) <input type="checkbox"/> 50.73(a)(2)(viii)(B) | | | |
| | | <input type="checkbox"/> 20.2203(a)(2)(i) <input type="checkbox"/> 50.36(c)(1)(i)(A) <input type="checkbox"/> 50.73(a)(2)(iii) <input type="checkbox"/> 50.73(a)(2)(ix)(A) | | | |
| 10. POWER LEVEL | | <input type="checkbox"/> 20.2203(a)(2)(ii) <input type="checkbox"/> 50.36(c)(1)(ii)(A) <input type="checkbox"/> 50.73(a)(2)(iv)(A) <input type="checkbox"/> 50.73(a)(2)(x) | | | |
| 26 | | <input type="checkbox"/> 20.2203(a)(2)(iii) <input type="checkbox"/> 50.36(c)(2) <input type="checkbox"/> 50.73(a)(2)(v)(A) <input type="checkbox"/> 73.71(a)(4) | | | |
| | | <input type="checkbox"/> 20.2203(a)(2)(iv) <input type="checkbox"/> 50.46(a)(3)(ii) <input type="checkbox"/> 50.73(a)(2)(v)(B) <input type="checkbox"/> 73.71(a)(5) | | | |
| | | <input type="checkbox"/> 20.2203(a)(2)(v) <input type="checkbox"/> 50.73(a)(2)(i)(A) <input type="checkbox"/> 50.73(a)(2)(v)(C) <input checked="" type="checkbox"/> OTHER | | | |
| | | <input type="checkbox"/> 20.2203(a)(2)(vi) <input type="checkbox"/> 50.73(a)(2)(i)(B) <input type="checkbox"/> 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 A. 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 | |
| | | | | | |
| 14. SUPPLEMENTAL REPORT EXPECTED | | | | | 15. EXPECTED SUBMISSION DATE |
| YES (If yes, complete EXPECTED SUBMISSION DATE). | | | | X | NO |
| | | | | | |
| MO DAY YEAR | | | | | |
| ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) | | | | | |
| <p>On August 6, 2005, Units 1 and 2 were shutdown due to operability concerns potentially affecting the site's four Emergency Diesel Generators (EDGs). Unit 1 entered Mode 3 at 0531 hours and Unit 2 entered Mode 3 at 0446 hours. The EDG operability was questioned due to concerns that the setpoint for the installed EDG differential overcurrent protective devices (i.e., 87DP relays) was not appropriate. Subsequently, it was determined that the setpoint for the 87DP relays, while not optimal, did not result in the EDGs being inoperable. As such, reporting of this condition is considered voluntary.</p> <p>The root cause of this event is replacement of the EDG 87DP differential overcurrent relays, in 1982, without adequate confirmation that the trip setting of the new model was appropriate. This reduced the margin between the 87DP relay trip setpoint and the normal operating current, thereby reducing the EDGs' tolerance to electrical disturbances.</p> <p>The existing 87DP relays were replaced with new solid state relays with increased margin to the operating current.</p> | | | | | |

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| Brunswick Steam Electric Plant (BSEP), Unit 1 | 05000325 | 2005 | -- 006 | -- 00 | 2 OF 5 |

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 August 6, 2005, Units 1 and 2 entered Mode 3 as a result of inserting a manual Reactor Protection System (RPS) [JC] actuation on each unit. Unit 1 entered Mode 3 at 0531 hours and Unit 2 entered Mode 3 at 0445 hours. The units were shut down due to operability concerns potentially affecting the site's four Emergency Diesel Generators (EDGs) [EK]. EDG operability was questioned due to concerns that the setpoint for the installed EDG differential overcurrent protective devices (i.e., 87DP relays) was not appropriate. As a result, the four EDGs were declared inoperable at 1840 hours on August 5, 2005, and preparations to shut down the units, in accordance with the requirements of Technical Specification 3.8.1, "AC Sources - Operating," commenced. Plant systems for both units responded per design. All control rods fully inserted on both units. Unit 2 Control Rod 18-35 was found to have bounced out to position 02 and was inserted manually to position 00 at 0454 hours.

The manual RPS actuation was initiated at approximately 26 percent of rated thermal power (RTP) on Unit 1 and at approximately 28 percent of RTP on Unit 2. As a result, an expected Reactor Pressure Vessel (RPV) coolant level shrink caused the reactor vessel water level to decrease below the Reactor Vessel Water Level - Low Level 1 setpoint, which resulted in a Primary Containment Isolation System (PCIS) [JM] 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 signals closed all of the PCIVs that were open at the time of the actuations. These actuations resulted from and were part of the pre-planned sequence of reactor shut down. As such, they are not reportable in accordance with 10 CFR 50.73(a)(2)(iv).

At 2124 hours on August 5, 2005, the NRC was notified (i.e., Event Number 41895), in accordance with 10 CFR 50.72(b)(2)(i), of the initiation of a shutdown required by the Unit 1 and Unit 2 Technical Specifications. Since the four EDGs had been declared inoperable, this condition was also reported in accordance with 10 CFR 50.72(b)(3)(v)(D), as a condition which could have prevented the fulfillment of the safety function of a system needed to mitigate the consequences of an accident.

This condition is being reported as a voluntary LER. It has been determined that the setpoint for the 87DP relays, while not optimal, did not result in the EDGs being inoperable. Therefore, in retrospect, the shutdown of the units was not required by Technical Specifications and there was not a condition which could have prevented the fulfillment of the safety function of a system needed to mitigate the consequences of an accident.

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EVENT DESCRIPTION

Initial Conditions

Prior to the event, both Units were operating at approximately 100 percent RTP. At the time the manual RPS actuations were initiated, Unit 1 was in Mode 1 with RTP reduced to approximately 26 percent and Unit 2 was in Mode 1 with RTP reduced to approximately 28 percent. All required safety-related systems for both units, with the exception of the EDGs, were operable. The EDGs, while considered inoperable at the time, were available in the event that offsite power was lost.

Discussion

On Thursday July 28, 2005, at 2319 hours, during a Technical Specification surveillance test run, EDG No. 4 locked out shortly after startup and before the generator circuit breaker closed. Initial investigation found that the generator overcurrent differential relay (i.e., the 87DP relay) had operated and the lockout relay (i.e., the 86DP relay) was in the tripped position.

Troubleshooting activities began to find the cause of the 87DP relay actuation. Maintenance technicians reported that carbon dust, which is somewhat conductive, was present on the excitation system collector ring. In addition, verbal communications between Maintenance and Engineering personnel erroneously indicated that the collector ring to ground insulation resistance reading was 200 ohms, which is indicative of a shorted condition. Maintenance personnel refurbished the collector rings and brushes in EDG No. 4 in accordance with OPM-GEN005, "Diesel Generator Electrical Inspections," and on July 29, 2005, obtained satisfactory megger readings of approximately 400 Mohms. EDG No. 4 was successfully started and was declared operable at 2055 on July 29, 2005. These conditions led Engineering personnel to conclude that the cause of the EDG No. 4 lockout was excessive carbon dust buildup on the collector rings which led to a short and causing the 87DP relay to trip.

At 2030 hours on July 29, 2005, a common cause evaluation was completed in accordance with Required Action D.3.1 of Technical Specification 3.8.1. This evaluation concluded that EDG No. 3 was vulnerable to the same failure mechanism because collector ring preventive maintenance was last performed in July 2004. EDG No. 1 and EDG No. 2 were not considered susceptible because collector ring preventive maintenance was last performed in May and June of 2005, respectively. Based on this information, EDG No. 3 was declared inoperable at 2030 hours on July 29, 2005. EDG No. 3 was returned to operable status at 1030 hours on Saturday, July 30, 2005, after performance of collector ring preventive maintenance and successful post maintenance testing were completed.

On Monday, August 1, 2005, a root cause investigation team was chartered for assembly on August 2, 2005. This team was formed to determine the root cause of the EDG No. 4 lockout. Based on reviewing data sheets from the OPM-GEN005 collector ring maintenance for EDG No. 4, it was found that the actual, as-found collector ring to ground insulation resistance reading was 270 kohms versus 200 ohms as verbally reported. This inconsistency, as well as a lack of physical evidence of shorting, and discussions with

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EVENT DESCRIPTION (continued)

external experts resulted in the root cause team eliminating excessive carbon dust buildup on the collector rings as the cause of the July 28, 2005, EDG No. 4 lockout.

The root cause team also reviewed historical EDG maintenance records and determined that, in 1982, the 87DP relays were replaced under Plant Modification 82-059 due to seismic qualification issues. The previous relays had a minimum pickup of 200mA (i.e., equivalent to 32 amps on the generator side). The new relays had revised setpoints which were lower, reduced from 32 amps to 16 amps. The engineering evaluation of the change stated that this would provide adequate protection for the generator and have no adverse effects on the generator stators. However, the modification did not evaluate the reduction in the operating margin of the reduced trip setpoints.

On August 5, 2005, an instrumented test of EDG No. 4 was performed. This test resulted in unexpectedly high measured differential current at the input of the 87DP relay, equivalent to 15.8 amps on the generator side. EDG No. 4 was considered degraded and two instrumented runs of EDG No. 2 were performed as part of the extent of condition assessment. As a result of an unrelated problem with 87DP relay on EDG No. 2, in both cases the EDG tripped when manipulating the associated cubicle door. However, sufficient data was collected to confirm amperage close to the 87DP relay setpoint.

Based on the data gathered from EDG No. 2 and EDG No. 4, it was determined that both EDGs were operating at or near the 87DP relay setpoint of 16 amps. As such, at 1840 on August 5, 2005, prior to completion of the root cause evaluation, a conservative decision was made to declare the four EDGs inoperable. Technical Specification 3.8.1, Condition G was entered and preparations began to shutdown both units. Unit 1 entered Mode 3 at 0531 hours and Unit 2 entered Mode 3 at 0445 hours.

Both plant and Operator response to the manual RPS initiation were as expected.

EVENT CAUSE

The root cause of this event is the 1982 replacement of the EDG 87DP differential overcurrent relays with a vendor recommended equivalent model without adequate confirmation that the trip setting maintained appropriate operating margin.

As discussed above, the 87DP relays, installed in 1982, had setpoints which were reduced from 32 amps to 16 amps. The engineering evaluation of the change stated that this would provide adequate protection for the generator and have no adverse effects on the generator stators. However, the modification did not evaluate the reduction in the operating margin of the reduced trip setpoints.

A number of 87DP relay trips have been experienced since 1982. In each case, these failures were attributed to failed components in the excitation system. However, it now appears that as a result of the

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EVENT CAUSE (continued)

1982 modification, the margin between the normal operation of the exciter (i.e., 14 to 16 amps) and the setpoint of the 87DP relays is so small that minor perturbations are sufficient to cause actuation of the 87DP relay.

Although the revised 87DP relay setpoint affected EDGs' tolerance for electrical disturbances, EDG reliability remained very high. Since 1982, there have been over 1,000 EDG start demands with a demonstrated EDG start reliability of 99.15 percent. This demonstrates that the 87DP relays would not inadvertently trip without an additional electrical perturbation in its EDG system. Therefore, it is concluded that this condition did not render the EDGs inoperable.

SAFETY ASSESSMENT

The safety significance of this condition is considered minimal.

Based on preliminary information from the root cause investigation team, this design issue was conservatively considered to be a potential common cause failure, the EDGs were declared inoperable, and the units shutdown. This allowed for the relays to be replaced with upgraded relays that restored more appropriate operating margin. Further investigation of the issue concluded that each individual relay would not inadvertently trip without an additional electrical perturbation in its EDG system. Therefore, the EDGs were not susceptible to a common cause failure associated with the 87DP relay margin issue and the setpoint for the 87DP relays, while not optimal, did not result in the EDGs being inoperable.

The EDGs provide a safety significant function in the event of a loss of offsite power. However, the safety significance of this design issue is considered to be very minimal due to the proven reliable performance of the relays and the need for an additional random failure in order to cause an inadvertent EDG trip.

CORRECTIVE ACTIONS

The existing 87DP relays were replaced with new solid state relays with increased margin to the operating current.

PREVIOUS SIMILAR EVENTS

This event is associated with a design deficiency introduced in 1982. Therefore, corrective actions associated with more recent design-related issues could not reasonably be expected to prevent this occurrence.

COMMITMENTS

No regulatory commitments are contained in this report.