



March 13, 2003

SERIAL: BSEP 03-0014

10 CFR 50.73

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

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1
DOCKET NO. 50-325/LICENSE NO. DPR-71
LICENSEE EVENT REPORT 1-03-001

Gentlemen:

In accordance with the Code of Federal Regulations, Title 10, Part 50.73, 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,

W. G. Noll
Plant General Manager
Brunswick Steam Electric Plant

CRE/cre

Enclosure: Licensee Event Report

IE22

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cc (with enclosure):

U. S. Nuclear Regulatory Commission, Region II
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Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@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 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 Brunswick Steam Electric Plant (BSEP), Unit 1		2. DOCKET NUMBER 05000325	3. PAGE 1 OF 6
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4. TITLE
Reactor Feed Pump Trip Results in Specified System Actuations

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
01	12	2003	2003	-- 001 --	00	03	13	2003	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE 1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more)									
10. POWER LEVEL 94	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)		X 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)		50.73(a)(2)(v)(C)					
	20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)		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	
NAME Charles R. Elberfeld, Sr. Engineering Technical Support Specialist	TELEPHONE NUMBER (Include Area Code) (910) 457-2136

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	EC	CL	General Electric Company	Y	X				

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

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

On January 12, 2003, at approximately 1552 hours, decreasing reactor coolant level, due to a reactor feedwater pump turbine (RFPT) trip, resulted in the actuation of the reactor protection system (RPS), as well as Group 2 and Group 6 primary containment isolation valve closures. After the plant trip, the four emergency diesel generators (EDGs) started due to an invalid signal generated by switchyard equipment. In addition, the Reactor Core Isolation Cooling system was manually operated to maintain coolant level in the reactor vessel. At the time of the event, Unit 1 was initially operating at 94 percent of rated thermal power.

The cause of the RPS and subsequent equipment actuations was attributed to the decrease in reactor vessel level caused by a RFPT 1B trip which was the result of insufficient lube oil pressure margin on the RFPT 1B bearing header during a Main Oil Pump (MOP) trip. With proper margin, the standby MOP would have been able to maintain bearing header oil pressure, thereby avoiding RFPT trip and the event. The cause of the automatic start of the EDGs is the failure of a Power Circuit Breaker (PCB) to open on its initial trip signal, which resulted in the invalid automatic EDG start signal. The safety significance of this occurrence is considered minimal.

RFPT 1B is being operated with both MOPs in operation until further investigation can be performed to resolve the rapid oil pressure decrease noted when an MOP is tripped in single MOP operation. The PCB was tested to ensure proper operation and returned to service.

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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 January 12, 2003, at approximately 1552 hours, decreasing reactor coolant level, due to a reactor feedwater pump turbine (RFPT) [TRB] trip, resulted in the actuation of the reactor protection system (RPS) [JC], as well as, Group 2 and Group 6 primary containment isolation [JM] valve closures. After the plant trip, the four emergency diesel generators (EDGs) [EK] automatically started due to an invalid signal generated from switchyard equipment. In addition, the Reactor Core Isolation Cooling (RCIC) [BN] system was manually operated to maintain coolant level in the reactor vessel. At the time of the event, Unit 1 was in Mode 1 (i.e., Power Operation), initially operating at 94 percent of rated thermal power (RTP). At 1840 hours, the NRC was notified (i.e., Event Number 39504) in accordance with 10 CFR 50.72(b)(2)(iv)(B) for an event or condition that results in actuation of the RPS when the reactor is critical.

This event is being reported in accordance with 10 CFR 50.73(a)(2)(iv)(A) as an event or condition that resulted in automatic actuation of: (1) the RPS, and (2) general containment isolation signals affecting containment isolation valves in more than one system, as well as the manual operation of the RCIC system. Discussion of the invalid actuation of the EDGs is included in this LER in lieu of the optional 60-day telephone notification provided in 10 CFR 50.73(a)(1).

EVENT DESCRIPTION

On January 12, 2003, Unit 1 was operating at 94 percent of RTP with all Emergency Core Cooling systems (ECCS) and the RCIC system operable. At approximately 1552 hours, control room operators received annunciators "RFP B BRG OIL PRESS-LOW" and "RFP B TURBINE TRIPPED," indicating that the RFPT 1B had tripped due to low bearing oil pressure. Operators immediately reduced reactor power by lowering reactor recirculation pump speeds and monitored the decreasing reactor coolant level. Reactor power was decreased to approximately 57 percent of RTP and an operator started to manually trip the RPS as the coolant level approached the automatic trip setpoint (i.e., Low Level 1). However, the RPS automatically tripped before the operator action was implemented.

The level transient also resulted in the initiation of primary containment isolation signals for Group 2 (i.e., Drywell Equipment and Floor Drain, Traversing In-core Probe, Residual Heat Removal (RHR) Discharge to Radwaste, and RHR Process Sample isolation valves), Group 6 (i.e., Containment Atmosphere Control/Dilution, Containment Atmosphere Monitoring, and Post Accident Sampling System isolation valves), and Group 8 (i.e., RHR Shutdown Cooling Suction and RHR Inboard Injection isolation) valves. The required equipment responded as designed and the Groups 2, and 6 valves, that were open at the time of the event, closed upon receipt of the isolation signals. The Group 8 valves were already closed at the time of the event. All control rods fully inserted into the core. Power Circuit Breaker (PCB) [52] 22A in the 230 kV electrical power system [FK] did not open initially, as designed, to separate the main transformer/generator from the grid, which resulted in initiation of an invalid signal that automatically started all four EDGs after the turbine/generator tripped. Electrical power was not lost to the emergency busses so the EDGs started successfully but did not load.

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

EVENT DESCRIPTION (continued)

Operators performed the required actions in accordance with Emergency Operating Procedure 1EOP-01-RSP, "Reactor Scram Procedure." The reactor mode switch was placed in the "shutdown" position.

On January 12, 2003, at approximately 1555 hours (i.e., three minutes from the start of the event), RFPT 1A tripped on high reactor water level as the reactor operator was placing the startup level control valve in service and, subsequently, reactor coolant level decreased. Operators manually started the RCIC system to control reactor coolant level; however, before level control could be regained, reactor coolant level decreased below the Low Level 1 setpoint, at approximately 1605 hours, which again initiated the associated logic signals (i.e., RPS and containment isolation). By 1607 hours, reactor coolant level was restored above the Low Level 1 setpoint, and at approximately 1613 hours, operators reset the RPS logic. By approximately 1638 hours, the RFPT 1A trip logic was reset and by 1647 hours, the 1A reactor feed pump was supplying coolant to the reactor. The RCIC system was secured and placed back in standby.

On January 12, 2003, at approximately 1720 hours, operators reset the containment isolation logic for the Group 2, 6, and 8 valves. By 1749 hours, all four EDGs were secured and placed in standby. Preliminary investigation indicated that the running main oil pump (i.e., MOP 1B-1) for RFPT 1B tripped and that the standby MOP (i.e., 1B-2) started; however, the standby pump did not maintain lube oil pressure and prevent RFPT 1B from tripping on low lube oil pressure. The plant remained in Mode 3 (i.e., Hot Shutdown) until reactor start-up was commenced on January 13, 2003.

EVENT CAUSE

The cause of the RPS and subsequent equipment actuations was attributed to decreasing reactor coolant level resulting from RFPT 1B tripping due to insufficient lube oil pressure margin on the RFPT 1B bearing header during the MOP trip. Each RFPT has two AC motor-driven MOPs. Each MOP is capable of supplying the necessary lube oil pressure and volume for RFPT operation. When the MOP 1B-1 for RFPT 1B tripped, MOP 1B-2 started; however, the standby pump did not maintain bearing header pressure and prevent the RFPT 1B from tripping on low lube oil pressure. The insufficient margin resulted in the RFPT trip which caused a decreasing coolant level in the reactor vessel and the subsequent RPS actuation and transient. With proper margin, MOP 1B-2 would have been able to recover bearing header oil pressure, thereby avoiding the event.

Troubleshooting activities included static and dynamic testing of the RFPT lube oil system and verification of acceptable instrumentation calibration. Some internal oil leaks were identified and corrected; however, subsequent testing activities indicated that bearing oil header pressure dropped too rapidly to ensure reliable RFPT operation with single MOP operation. Similar testing was performed on RFPT 1A and, in each case, the standby MOP was able to maintain pressure above the RFPT trip setpoint when the operating MOP was tripped.

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EVENT CAUSE (continued)

The initiator of this event has been determined to be the trip of MOP 1B-1 upon loss of electrical power caused by a motor control circuit fault (i.e., an end-of-life short in the motor start relay coil [CL] Part Number: 55-501336G022, Manufacturer: General Electric Company) which resulted in a blown control power fuse.

The cause of the automatic start of the EDGs is failure of PCB 22A to open on its initial trip signal which resulted in the invalid automatic EDG start signal. Event data demonstrates that, when the turbine/generator trip occurred, a trip signal was received at the backup trip coil; however, PCB 22A did not open until approximately 13 seconds later when it received a subsequent trip signal to the primary trip coil. If PCB 22A would have opened, as designed, when the backup trip coil received the trip signal, the main transformer/generator would have been disconnected from the grid and the electrical protective logic would not have started the EDGs. The trip coil was replaced, as a conservative measure, and PCB 22A was tested to ensure proper operation. Subsequent testing of the trip coil could not replicate the suspected sticking; however, opening of PCB 22A, both during the event and during subsequent post-maintenance testing provides adequate assurance that it is functioning properly. As a result of conversations with the vendor for this non-safety related equipment, it was determined that similar problems had occurred in the industry in recent history, primarily on breakers that remain in service for long periods of time, such as generator breakers. Based on this vendor input and BSEP engineering evaluation, the most probable cause of PCB 22A not opening on its initial trip signal is attributed to deformation of the trip lever roller bearing and/or the face of the trip finger in contact with the trip lever roller bearing. The combination of time and static load on the operating mechanism is believed to be causing minute deformation of the suspected components, resulting in occasional sticking of the mechanism.

CORRECTIVE ACTIONS

1. The motor start relay coil and control power fuse were replaced for MOP 1B-1. This coil and other non-safety related coils have been previously designated as "run-to-failure" for maintenance purposes. This coil replacement strategy is being re-evaluated.
2. Condensate and Feedwater system operating procedures for both Units 1 and 2 have been revised to permit RFPT operation with both MOPs running. Operators have been provided guidance to operate RFPT 1B with both MOPs running.
3. During the next Unit 1 refuel outage (i.e., B115R1), further investigation of the RFPT 1B lubricating oil system will be conducted to determine the resolution of the issue associated with the rapid bearing header pressure decrease noted when a MOP trips in single MOP operation.

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

4. A multi-disciplined team has been formed to evaluate test data and numerous potential enhancements to the RFPT lubricating oil system which include hardware, instrumentation, system logic, and periodic maintenance improvements. By May 22, 2003, the team will provide recommendations to improve the operation and reliability of the RFPT lubricating oil system. The recommendations will be implemented as appropriate.
5. PCB 22A was tested to ensure proper operation prior to return to service. Trip operating mechanisms for the appropriate PCBs are being replaced in accordance with vendor recommendations as system/equipment availability allows.

SAFETY ASSESSMENT

The safety significance of this occurrence is considered minimal. The reactor trip is an anticipated operational occurrence bounded by existing safety analyses. Operation of the plant was within the design limits and the affected systems responded as designed, with the exception of the PCB 22A failure to initially trip, resulting in the invalid EDG start signals and the EDGs starting. Valid start signals for the EDGs, as required by the plant's Technical Specifications, include signals resulting from a loss of coolant accident (LOCA) and from emergency bus degraded voltage or undervoltage conditions. Neither LOCA nor emergency bus degraded voltage or undervoltage conditions were present during this event; however, the EDGs could have performed their safety functions if required. In addition, the ECCS could have responded if needed.

PREVIOUS SIMILAR EVENTS

LER 1-99-009, documented an event on November 5, 1999, in which an unplanned RFPT 1B trip during reactor feed pump turbine testing, resulted in the manual actuation of the reactor protection system with the reactor at rated thermal power. The cause of the RFPT trip was attributed to man-machine interface, during the performance of the test procedure. Corrective actions included modifying test switches from spring-return type to key-lock to maintain contacts type, decreasing RFPT test frequency, and making test conditions more restrictive. None of these corrective actions would be reasonably expected to prevent the January 12, 2003, event.

Action Request (AR) 25823 documented an event on November 18, 2000, which resulted in the RFPT 1A trip without a reactor trip. In this event the MOP 1A-2 tripped due to a shorted coil at the MOP breaker. Both the MOP 1A-1 and the emergency oil pump (a DC motor-driven pump intended only to allow coastdown in the event of dual MOP failure) immediately started. Within approximately 60 seconds, the 1A RFPT tripped with an accompanying annunciator indicating thrust bearing wear. The RFPT trip was caused by a combination of pressure switches not being in calibration and the emergency oil pump operating at too high of a pressure which resulted in the sensed thrust bearing wear trip signal. Corrective actions included calibrations and procedure/process changes. None of these corrective actions would be reasonably expected to prevent the January 12, 2003, event.

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

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.

- During the next Unit 1 refuel outage (i.e., B115R1), further investigation of the RFPT 1B lubricating oil system will be conducted to determine the resolution of the issue associated with the rapid bearing header pressure decrease noted when a MOP trips in single MOP operation.
- By May 22, 2003, a multi-disciplined team will provide recommendations to improve the operation and reliability of the RFPT lubricating oil system. The recommendations will be implemented as appropriate.