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APR 1 8 2001

SERIAL: BSEP 01-0044 10 CFR 50.73

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

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-324/LICENSE NO. DPR-62
LICENSEE EVENT REPORT 2-01-001

Gentlemen:

In accordance with the Code of Federal Regulations, Title 10, Part 50.73, Carolina Power & Light Company submits the enclosed Licensee Event Report. This report fulfills the requirement for a written report within sixty (60) days of a reportable occurrence. No commitments are contained in this letter or its enclosure.

Please refer any questions regarding this submittal to Mr. David C. DiCello, Manager – Regulatory Affairs, at (910) 457-2235.

Sincerely,

C. J. Gannon
Plant General Manager
Brunswick Steam Electric Plant

CRE/cre

Enclosure: Licensee Event Report

IE22

Brunswick Nuclear Plant
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cc (with enclosure):

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NRC FORM 366 (1-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 6-30-2001

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fedback to industry. Forward 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 Office, 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)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Brunswick Steam Electric Plant (BSEP), Unit 2	05000324	1 OF 4

TITLE (4)

EHC System Malfunction Results in Specified System Actuations

EVENT DATE (5)			LER NUMBER (6)					REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER			REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
02	23	2001	2001	--	001	--	00	04	18	2001		05000
											FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	37	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
		20.2203(a)(2)(iii)	50.46(a)(3)(ii)	50.73(a)(2)(v)(C)	Specify in Abstract below or in NRC Form 366A
		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)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Charles R. Elberfeld, Senior Analyst - Regulatory Affairs	(910) 457-2136

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	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) (16)

On February 23, 2001, at 2220 hours, with a shutdown of Unit 2 for a refueling outage in progress, a false high turbine speed signal in the Electro-Hydraulic Control (EHC) system resulted in turbine control valves/combined intermediate valves closing and bypass valves opening followed by a generator/turbine trip from approximately 37 percent of rated thermal power. The four emergency diesel generators automatically started as designed when the generator tripped. Operators inserted a manual trip of the reactor protection system (RPS) to shut down the reactor, and the associated reactor vessel coolant low level transient resulted in the actuation of an automatic RPS signal as well as closure of containment isolation valves in groups 2 and 6. The plant responded as designed to the event.

The cause of the event is attributed to an intermittent electrical connection that resulted in a false high turbine speed signal being detected by the frequency-to-voltage converter card in the EHC system. Maintenance personnel identified a wire termination with a loose crimped ring lug in a junction box located on the front standard of the turbine. Evaluation of the lug/wire termination determined that the wire had not been fully inserted into the barrel of the lug at the time the termination was crimped. The termination appeared to be from original construction of the plant.

The lug was replaced and terminated in accordance with plant procedures. The other electrical terminations in the junction boxes on the turbine were checked for loose terminations and none were identified. The safety significance of this event is considered to be minimal. This event is being reported in accordance with 10 CFR 50.73(a)(2)(iv)(A).

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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 February 23, 2001, at approximately 2220 hours, a Unit 2 turbine Electro-Hydraulic Control (EHC) system [JJ] malfunction annunciator was received and turbine bypass valves [JI] were observed to be opening by control room personnel. Annunciators and indications were received in the control room in response to a generator primary lockout and turbine trip. All four emergency diesel generators (EDGs) [EK] automatically started as designed, but did not load due to no loss of electrical power to the emergency buses. Within approximately 11 seconds, operators inserted a manual trip of the reactor protection system (RPS) [JC] and the reactor was shut down. An expected reactor vessel coolant level shrink occurred causing coolant level to decrease to approximately 138 inches above instrument zero (i.e., instrument zero is approximately 7.5 inches above the top of active fuel). The level transient resulted in the initiation of primary containment isolation [JM] signals for group 2, 6, and 8 isolation valves, as well as an automatic trip of the RPS. The plant responded as designed to the event.

At the time of the event, Unit 2 was in Mode 1 operating at approximately 37 percent of rated thermal power (RTP). On February 24, 2001, at 0053 hours, notification was made to the NRC (Event Number 37777) in accordance with 10 CFR 50.72(b)(2)(iv)(B) for an event or condition that resulted in actuation of the RPS when the reactor is critical, and in accordance with 10 CFR 50.72(b)(3)(iv)(A) as any event or condition that resulted in valid actuation of specified systems. 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 the RPS, containment isolation signals affecting containment isolation valves in more than one system, and EDGs.

EVENT DESCRIPTION

On February 23, 2001, at 2056 hours, operators commenced Unit 2 reactor shutdown, from approximately 99 percent of RTP, for a scheduled refueling outage. All Emergency Core Cooling systems as well as on-site/off-site power sources were operable. By 2220 hours, reactor power had been reduced to approximately 37 percent of RTP. At that time, control room operators received an "EHC ELEC MALFUNCTION" annunciator, followed by numerous other annunciators and indications. The malfunction resulted in closure of turbine control valves and combined intermediate valves. In anticipation of rising reactor pressure, three turbine bypass valves opened, resulting in a decrease in first stage turbine pressure which bypassed RPS >/= 30 percent RTP "Turbine Stop Valve – Closure" and "Turbine Control Valve Fast Closure, Control Oil Pressure – Low" trip functions. Annunciator "TURB CV FAST CLOS/SV/RPT TRIP BYPASS," was received, alerting the operators to this condition. The open turbine bypass valves also resulted in a generator trip on reverse power and a subsequent turbine trip. All four EDGs started but did not load because electrical power was not lost to the emergency buses. The turbine trip did not result in a reactor trip at 37 percent RTP due to the RPS trip functions being bypassed, as designed.

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

Approximately 11 seconds after the turbine trip, reactor operators inserted a manual RPS trip to shut down the reactor. All control rods fully inserted and an expected reactor vessel coolant level shrink occurred causing coolant level to decrease from approximately 187 (normal) to 138 inches above instrument zero. The level transient 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, as well as an automatic trip of the RPS. The required equipment responded as designed and the group 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. Operators performed the required actions in accordance Emergency Operating Procedure 2EOP-01-RSP, "Reactor Scram Procedure."

On February 23, 2001, at 2221 hours, the reactor mode switch was placed in the "shutdown" position, at 2226 hours, the RPS trip logic was reset, and at 2229 hours, the reactor mode switch was locked in "shutdown." By 2307 hours all four EDGs were shut down, and at 2308 hours, 2EOP-01-RSP was exited. By February 24, 2001, at 0014 hours, all four EDGs were placed in the standby mode. At 0550 hours, Unit 2 entered mode 4 (i.e., cold shutdown).

EVENT CAUSE

The cause of the event is attributed to a false high turbine speed signal being detected by the frequency-to-voltage converter card in the EHC system. An intermittent electrical connection resulted in electrical noise being induced on the speed circuit. An actual source of the electrical noise could not be identified or duplicated; however, the plant response was duplicated on the plant simulator by simulating the high turbine speed signal.

After the event, maintenance personnel conducted an immediate field investigation and identified an intermittent open connection in a junction box located on the front standard of the turbine. A wire termination with a loose crimped ring lug on the field side (i.e., field cable going into the termination box) of the termination block was the source of the intermittent connection. The lug connection was tight at the terminal block, where a screw held the ring lug in place, but the wire could be moved inside the barrel portion of the lug where the lug was crimped to the wire. This termination is for one of the two wires carrying the turbine primary speed pickup signal from the speed pickup to the frequency to voltage converter card. The lug and crimped connection appeared to be from original construction of the plant.

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

CORRECTIVE ACTIONS

The lug was replaced and terminated in accordance with plant procedures. The other electrical terminations in the junction boxes on the turbine were checked for similar conditions (i.e., loose terminations) and none were identified. The lug and its section of crimped wire were sent to the Harris Energy and Environmental Center for evaluation. The evaluation determined that the wire was not fully inserted into the barrel of the lug when the connection was originally crimped.

The EHC system was aligned and tested in accordance with special process procedures 0SPP-EHC001, "Electro Hydraulic Controls System Alignment," and 0SPP-EHC003, "Main Turbine Alarm and Trip Functional Test." No additional equipment malfunctions were identified as part of the alignment/test activities. On March 27, 2001, the turbine/generator was brought on line at the completion of the refuel outage. Since that time, no operational or EHC system anomalies related to the event have been identified.

Additionally, reviews of maintenance/corrective action history and termination procedures were conducted, as well as discussions with maintenance personnel, to identify any potential emerging trend related to crimping of lugs for wire terminations. No such trend was identified. To gain additional experience with this issue, inspections of associated Unit 1 turbine electrical junction boxes are planned for a future appropriate time (e.g. outage of sufficient duration). As part of the established training program, a training needs analysis will be conducted to determine applicability for lessons learned dissemination and the event will be discussed as a part of licensed operator continuing training.

SAFETY ASSESSMENT

The safety significance of this event is considered to be minimal. All required systems responded to the transient as designed and so the consequences of the transient on the fuel and vessel overpressure were minimal. The analyses in Chapter 15 of the Updated Final Safety Analysis Report fully bounded this event.

PREVIOUS SIMILAR EVENTS

A similar previous event of an RPS actuation caused by a turbine supervisory equipment-related malfunction was documented by LER 2-99-002. A turbine high vibration trip signal was initiated due to failed electrical connections on a vibration detector. These were spot welded connections internal to the detector and that model of detector was changed out. The corrective actions associated with LER 2-99-002 could not reasonably be expected to prevent the event documented in LER 2-01-001.