NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Brunswick Steam Electric Plant Unit 1	0 5 0 0 0 3 2 5	1 OF 0 4

TITLE (4) Inoperability of High Pressure Coolant Injection (HPCI) System (E41) Due to Failure of HPCI Turbine Steam Inlet Isolation Valve, E41-F001, During Operability Testing

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0 5	2 8	8 8	8 8	- 0 1 2	- 0 1	0 9	0 7	8 8		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 0 0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	X 50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
M. J. Pastva Jr., Regulatory Compliance Specialist	AREA CODE 9 1 9 4 5 7 - 1 2 3 1 5

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	
X	B J	I M O	P 2 9 6	Y							
D	B J	I S V	A 3 9 1	Y							

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

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

At 2130 hours on 5/28/88, during the Unit 1 operability test of the High Pressure Coolant Injection (HPCI) System (E41), Periodic Test (PT)-09.2, the HPCI turbine steam supply isolation valve, E41-F001, would not open. Unit 1 was at 100% power. The HPCI System was declared inoperable. The Reactor Core Isolation Cooling, Residual Heat Removal/Low Pressure Coolant Injection, Automatic Depressurization Systems, and the A and B Core Spray subsystems were in standby readiness.

E41-F001 would not open due to failure of the valve motor windings resulting from mechanical and thermal binding of the valve disc within the valve body. Mechancial binding was due to inadequate disc-to-body clearance tolerances resulting from procedural inadequacies and lack of in-depth valve repair training of the personnel involved with a rebuild of the valve during the unit 1985 refueling/maintenance outage. Other failures of the valve occurred on 12/31/87 (LER 1-87-023) and on 7/1/88 (LER 1-88-017).

As interim action to help correct the thermal binding problem, a hole was drilled in the valve disc and it was rebuilt, satisfactorily tested, and at 2202 hours on 6/6/88, the HPCI System was returned to standby readiness. As additional action to correct the problem, double (split) discs will be installed in the F001 of each unit during future refueling outages. The respective Unit 2 valve was satisfactorily tested for proper operation on 6/14/88. Appropriate procedure revisions will be implemented by 9/15/88.

Initial Conditions

Unit 1 was operating at 100% power with the operability test of the unit High Pressure Coolant Injection (HPCI) System (E41) (EIIS/BJ), Periodic Test (PT)-09.2, in progress. The unit Reactor Core Isolation Cooling (RCIC) System (EIIS/BN), along with the Automatic Depressurization System (ADS) (EIIS/*), Residual Heat Removal/Low Pressure Coolant Injection (RHR/LPCI) System (EIIS/BO), and the A and B Core Spray (CS) subsystems (EIIS/BM), were operable and in standby readiness.

Event Description

At 2130 hours on May 28, 1988, during an attempt to run the HPCI turbine (EIIS/BJ/TRB) in accordance with Step 7.1.22 of PT-09.2, the HPCI turbine steam supply valve, E41-F001, (EIIS/BJ/ISV) failed to open. Approximately one minute after the open command to the valve was initiated by the Control Operator (CO), position indication of the valve was lost. An Auxiliary Operator (AO), dispatched to the 250 volt (V) direct current (dc) breaker compartment B21 (EIIS/BJ/PL) of the valve motor control center (MCC) 1XDA (EIIS/BJ/MCC), verified that the valve motor breaker had tripped on magnetic overloads. The HPCI System was declared inoperable effective at 2130 hours on May 28, 1988, and a limiting condition for operation (LCO) was established in accordance with Technical Specifications. In addition, a Work Request/Job Order (WR/JO) was initiated for investigation and repair of the incurred failure.

Event Investigation

A static inspection of the valve determined the failure of the valve to open resulted from failure of the valve motor (EIIS/BJ/MO), Porter-Peerless Part No. 698-941-60. A replacement motor was installed, and motor actuator characterizer diagnostic (MAC) testing was performed on the valve, Anchor Darling 10", 600-pound wedge gate valve. Two tests were performed, one at 0 pounds per square inch (psi) differential pressure (dP) across the valve and one at 1000 psi dP. The results of the diagnostic testing and visual observation indicated that a 1000 psig dP, sticking and/or binding was occurring within the valve seat area.

Disassembly of the valve revealed that inadequate valve disc-to-body clearance on the upstream side of the valve had caused binding of the disc, which resulted in excessive loading of the valve motor and subsequent failure of the motor due to overheating. It was found that one side of the valve disc satellite overlay had been machined while the other side had not. Consequently, the disc had become out-of-center within the valve body guides. The improper clearance resulted in a much greater than desired sliding friction between the valve body

*EIIS system description unavailable.

guides and the valve disc. Consequently, when the disc was pulled upward during opening of the valve, abnormal binding of the disc, combined with upstream pressure to force the disc against the guide (thereby gouging the valve guide) caused the valve motor to overload. In addition, it was noted that the valve stem was slightly bent (0.065" total runout), and the stem packing carbon spacer was found to be cocked, both factors of which may have contributed to the incurred binding.

A new valve disc was machined and installed and the valve was reassembled and again MAC tested. At 1000 psi dP, the valve showed signs of mechanical binding as evidenced by excessive valve operator motor amperage. Disassembly of the valve revealed superficial scratches at the 6 o'clock position on the valve disc, which were interpreted by the valve vendor technical representative as indicative of the disc binding within the valve seat. Upon recommendations of the valve technical representative, the valve disc was machined to change the disc angle as it was felt the valve was seating excessively hard. The valve was reassembled and during subsequent MAC testing at 1000 psi dP, it once again exhibited excessive actuator motor amperage. Discussions with the vendor design engineer concluded that the valve disc was thermally binding in the valve seat due to unequal heatup of the valve disc. Due to the suspected thermal binding, flex in the valve disc wedge was restricted upon closure of the valve. Consequently, insufficient flex on the upstream side of the valve disc existed under line pressure, and did not allow equalization of pressure between the disc when the valve was given an open signal.

The inadequate disc-to-body clearance in the valve is attributed to a combination of procedural inadequacies and a lack of in-depth valve repair training of personnel involved with the prior rebuild of the valve during the unit 1985 refueling/maintenance outage. Procedures in use at that time for the machining of valve discs did not specify that equal amounts should be machined from the valve disc during valve rebuilding.

Research of work history regarding this valve revealed that this is the third valve motor failure since 1985. One of these failures met the LER reportability criteria and was reported in LER 1-87-023. It is felt the inadequate disc-to-body clearance in the valve may have played a significant role in these failures of the valve actuator motor.

In addition, a subsequent failure of the valve, attributed to the thermal binding problem, occurred on July 1, 1988 (see LER 1-88-017).

Corrective Action

In accordance with recommendations by the valve vendor technical representative which were concurred with through a plant engineering evaluation, a hole was drilled in the valve disc in order to allow equalization of line pressure on the upstream side of the valve. The valve was reassembled and following subsequent satisfactory MAC testing, the HPCI System was satisfactorily tested and returned to standby readiness at 2202 hours on June 6, 1988.

The respective Unit 2 valve, 2-E41-F001, did not show signs of abnormal operation. On June 14, 1988, the valve was satisfactorily MAC tested at HPCI steam line pressure.

As the result of additional review/evaluation of this event and the failure of the valve on July 1, 1988, plant modifications will be implemented on each unit to install a double (split) disc in place of the presently installed single gate flex wedge disc for the valve. Planned completion of this action is during the next refueling/maintenance for Unit 2 and during the following refueling/maintenance outage for Unit 1.

By September 15, 1988, the maintenance procedure (MP) for valve seat and disc repair, MP-46, will be revised to include vendor recommendations regarding disc-to-in-body guide clearances and to specify that equal amounts of metal be removed from each side of the disc during machining.

Event Assessment

This event rendered the HPCI System incapable of an automatic response to a reactor low level condition; however, should the HPCI System have been required to operate, the HPCI E41-F001 could have been manually opened to operate the system. The consequences of a reactor low level condition during the time frame of this event were mitigated due to the availability of the ADS, RHR, RCIC, and CS Systems, which would have automatically operated in order to restore and maintain reactor level.

CP&L

Carolina Power & Light Company

Brunswick Steam Electric Plant
P. O. Box 10429
Southport, NC 28461-0429
September 7, 1988

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SERIAL: BSEP/88-0841

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

BRUNSWICK STEAM ELECTRIC PLANT UNIT 1
DOCKET NO. 50-325
LICENSE NO. DPR-71
SUPPLEMENT TO LICENSEE EVENT REPORT 1-88-012

Gentlemen:

In accordance with Title 10 to the Code of Federal Regulations, the enclosed Supplemental Licensee Event Report is submitted. The original report fulfilled the requirement for a written report within thirty (30) days of a reportable occurrence and is in accordance with the format set forth in NUREG-1022, September 1983.

Very truly yours,

J. L. Harness, General Manager
Brunswick Steam Electric Plant

MJP/bvc

Enclosure

cc: Mr. B. C. Buckley
Dr. J. N. Grace
BSEP NRC Resident Office

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