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JUN 26 2015

10 CFR 50.73

Serial: BSEP 15-0052

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

Subject: Brunswick Steam Electric Plant, Unit No. 2  
Renewed Facility Operating License No. DPR-62  
Docket No. 50-324  
Licensee Event Report 2-2015-002, Revision 1

Reference: LER 2-2015-002 for Brunswick, Unit 2, "Setpoint Drift in Main Steam Line  
Safety/Relief Valves Results in Three Valves Inoperable," Revision 0,  
dated May 5, 2015, ADAMS Accession Number ML15133A320

In accordance with the Code of Federal Regulations, Title 10, Part 50.73, Duke Energy  
Progress, Inc., submits the enclosed Revision 1 to Licensee Event Report (LER) 2-2015-002.  
This report provides results of the completed cause evaluation.

Please refer any questions regarding this submittal to Mr. Lee Grzeck, Manager – Regulatory  
Affairs, at (910) 457-2487.

Sincerely,

William R. Gideon

SWR/swr

Enclosure: Licensee Event Report 2-2015-002, Revision 1

IE22  
NRK

U.S. Nuclear Regulatory Commission  
Page 2 of 2

cc (with enclosure):

U. S. Nuclear Regulatory Commission, Region II  
ATTN: Mr. Victor M. McCree, Regional Administrator  
245 Peachtree Center Ave, NE, Suite 1200  
Atlanta, GA 30303-1257

U. S. Nuclear Regulatory Commission  
ATTN: Ms. Michelle P. Catts, NRC Senior Resident Inspector  
8470 River Road  
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U. S. Nuclear Regulatory Commission  
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**LICENSEE EVENT REPORT (LER)**(See Page 2 for required number of  
digits/characters for each block)

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 FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollections.Resource@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.

**1. FACILITY NAME**

Brunswick Steam Electric Plant (BSEP) Unit 2

**2. DOCKET NUMBER**

05000324

**3. PAGE**

1 OF 4

**4. TITLE**

Setpoint Drift in Main Steam Line Safety/Relief Valves Results in Three Valves 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
03	10	2015	2015	02	01	06	26	2015	FACILITY NAME	DOCKET NUMBER
										05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
N Defueled	<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  000	<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)
	<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 type="checkbox"/> OTHER
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" 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**

## LICENSEE CONTACT

Lee Grzeck, Manager – Regulatory Affairs

## TELEPHONE NUMBER (Include Area Code)

(910) 457-2487

**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
B	SB	RV	T020	No					

**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 March 10, 2015, BSEP received the results of testing of eleven main steam line safety relief valves (SRVs) removed from Unit 2 during the spring Unit 2 refueling outage. Three of the eleven valves were found to have as-found lift setpoints of their pilot valves outside the +/-3 percent tolerance required by Technical Specification (TS) 3.4.3. One SRV was 3.2 percent high; one SRV was 3.6 percent high, and one SRV was 4.0 percent low. Elevated lift pressures resulted from micro-cracking remaining on the pilot disc surface which allowed a localized region of the platinum coating to degrade, resulting in slight corrosion bonding which raised the breakaway force needed to open the pilot. No cause was identified for the one SRV having a reduced lift setpoint. This event had no adverse impact on nuclear safety. Although the SRV setpoint limits required by the TS were exceeded, the plant condition was bounded by the Brunswick Unit 2 Cycle 21 Reload Safety Analysis, demonstrating that the SRVs could have performed their safety function of limiting reactor vessel overpressure. TS 3.4.3 requires ten of the eleven installed SRVs to be operable. Since only eight SRVs were operable, this event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) for operation prohibited by the plant's TS. The SRV pilot valves were replaced with certified spares before the startup of Unit 2. A maintenance procedure will be revised, and a different base metal for the pilot valve will be assessed.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

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 FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to [Infocollects.Resource@nrc.gov](mailto:Infocollects.Resource@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.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
Brunswick Steam Electric Plant (BSEP) Unit 2	05000324	2015	- 002	001	2 OF 4

**NARRATIVE**

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

Introduction*Initial Conditions*

At the time the condition was found, Unit 2 was in a refueling outage with the reactor vessel defueled.

*Reportability Criteria*

Unit 2 Technical Specification (TS) 3.4.3 requires at least 10 of 11 main steam [SB] line safety/relief valves (SRVs) to be operable. Per Surveillance Requirement (SR) 3.4.3.1, each valve is required to open within +/-3 percent of its opening setpoint. As-found testing of the valves indicated that three of the valves had lift setpoints outside this tolerance. Based on the causes of the inoperability described below, it was concluded that at least two SRVs were inoperable when the unit was in operation. Consequently, the plant operated in a condition which is prohibited by the TS, that is, with fewer than the required number of SRVs having lift setpoints within the 3 percent tolerance. Therefore, the condition is being reported per 10 CFR 50.73(a)(2)(i)(B) for operation in a condition prohibited by the plant TSs.

Event Description

During the spring 2015 Unit 2 refueling outage, all 11 Model 7657F Target Rock Two-Stage pilot valve assemblies in the SRVs were replaced with certified spares. The removed SRV pilot valves were sent to National Technical Systems (NTS) to determine the as-found set pressure. On March 10, 2015, test results were reported to BSEP. The test results showed that two of the 11 valves actuated at pressures outside of the 3 percent tolerance allowed by TS 3.4.3. A third valve was reported out of tolerance on the following day, March 11, 2015. The test data for the valves found out of tolerance are shown below:

Valve Identification	TS Setpoint (psig)	As-Found Lift Pressure (psig)	Percent Difference
S/N 1082	1150	1191	+3.6
S/N 1086	1130	1166	+3.2
S/N 1097	1130	1085	-4.0

LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Brunswick Steam Electric Plant (BSEP) Unit 2	05000324	YEAR	SEQUENTIAL NUMBER	REV NO.	3 OF 4
		2015	- 002	- 001	

## NARRATIVE

Event Cause

The elevated lift setpoints of SRV S/Ns 1082 and 1086 resulted from slight corrosion bonding between the pilot disc and seat. The corrosion bonding increases the breakaway force needed to open the pilot and actuate the main valve stage.

Corrosion bonding of the pilot disc and seat resulted from discontinuities in the platinum coating on the pilot valve which allow oxygen and moisture to contact the Stellite 6B base metal. The discontinuities in the platinum occurred most frequently in localized sites where microcracking was present on the base metal of the disc. The microcracking, in turn, was a consequence of carbide inclusions inherent in the Stellite 6B. Carbide inclusions are typically less than 10 micrometers in length. Machining and polishing techniques used in surface preparation of the pilot disc occasionally caused the carbide inclusions to crack or pull out of the base metal rather than forming a uniformly planar surface. The resulting surface irregularities in the base metal were typically less than 10 micrometers in length and became stress risers when the platinum coating was applied. The probability of developing a discontinuity in the platinum coating was slightly higher in the vicinity of these stress risers.

The cause of the decreased initial lift setpoint in SRV S/N 1097 is not known. After the initial test, four subsequent tests resulted in valve lifts that were within the TS +/-3 percent tolerance. The valve was disassembled and all internals inspected. No conditions were identified which could account for the initial lift setpoint being out of tolerance.

Safety Assessment

The purpose of the safety/relief valves is to provide overpressure protection for the reactor coolant system. The as-found condition of the Unit 2 SRVs was compared to the Brunswick Unit 2 Cycle 21 Reload Safety Analysis. The most limiting case of the overpressurization analysis is for main steam isolation valve closure. It assumes one SRV is inoperable; two SRVs drift to 6 percent above setpoint and one SRV drifts to 10 percent above setpoint. The maximum predicted steam dome pressure in this situation is 1315 psig, which is below the BSEP Unit 2 safety limit of 1325 psig. In addition, the analysis bounds the as-found condition in which two valves had setpoints between 3 and 4 percent high, and one valve had a setpoint at 4 percent low. Therefore, the SRVs always remained capable of performing their safety function of preventing overpressurization of the reactor coolant system.

Based on the foregoing analysis, it is concluded that this event had no adverse impact on nuclear safety.

Corrective Actions

Any changes to the corrective actions and schedules noted below will be handled in accordance with the site's corrective action program.

All 11 Unit 2 SRV pilot valves were replaced with refurbished and certified spares during the spring 2015 refueling outage.

For pilot valve 1097, which experienced a decreased lift setpoint, BSEP will replace all internal parts that affect the set pressure of the valve. This action will be completed before the valve is re-installed on either unit.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Brunswick Steam Electric Plant (BSEP) Unit 2	05000324	YEAR	SEQUENTIAL NUMBER	REV NO.	4 OF 4
		2015	- 002	- 001	

**NARRATIVE**

BSEP will revise procedure 0CM-VSR509 to improve pilot valve disc surface preparation and perform a verification of the surface characteristics to reduce the probability of microcracking which can lead to degradation of the platinum coating. This action will be completed by July 31, 2015.

BSEP will also assess the possible use of Stellite-21 material for the pilot disc base metal. The assessment will be completed by September 30, 2015.

Previous Similar Events

A review of LERs and corrective action program condition reports identified two previous similar occurrences within the past three years.

- LER 2-2013-003, dated July 22, 2013, Adams Accession Number ML13212A170
- LER 1-2014-005, dated July 21, 2014, Adams Accession Number ML14212A031

These events also resulted from corrosion bonding between pilot discs and seats, which is a recurring problem throughout the boiling water reactor industry. Previous corrective actions did not prevent this event from occurring because the effect of carbide inclusions in pilot disc base metal upon the quality of surface preparation was not previously known or accounted for in the Ion Beam Enhanced Deposition (IBED) process.

Commitments

No regulatory commitments are contained in this report.