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10 CFR 50.73

August 3, 2017

Serial: BSEP 17-0065

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 Nos. DPR-62
Docket No. 50-324
Licensee Event Report 2-2017-003

In accordance with the Code of Federal Regulations, Title 10, Part 50.73, Duke Energy Progress, LLC, submits the enclosed Licensee Event Report (LER). This report fulfills the requirement of 10 CFR 50.73(a)(1) for a written report within sixty (60) days of a reportable occurrence.

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

Sincerely,

A handwritten signature in black ink, appearing to read "WRG", written over a light blue horizontal line.

William R. Gideon

SWR/swr

Enclosure: Licensee Event Report 2-2017-003

U.S. Nuclear Regulatory Commission

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cc (with enclosure):

U. S. Nuclear Regulatory Commission, Region II
ATTN: Ms. Catherine Haney, Regional Administrator
245 Peachtree Center Ave, NE, Suite 1200
Atlanta, GA 30303-1257

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LICENSEE EVENT REPORT (LER)
(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

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 Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOF-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
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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
06	05	2017	2017	003	00	08	03	2017	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
1	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
10. POWER LEVEL 087	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<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)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<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)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER	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
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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	Y					

14. SUPPLEMENTAL REPORT EXPECTED <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	15. EXPECTED SUBMISSION DATE MONTH: _____ DAY: _____ YEAR: _____
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On June 5, 2017, BSEP received the results of testing of eleven main steam line safety relief valves (SRVs) removed from Unit 2 during the spring 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 9.1 percent high. One SRV was 8.6 percent high, and one SRV was 5.0 percent high. Evaluation determined that the elevated lift pressures in two valves resulted from corrosion bonding of the SRV pilot valves which raised the breakaway force needed to open the pilot. The third valve experienced steam erosion. 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 22 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 less than ten 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 procedure was revised to reduce corrosion bonding by improving surface preparation of SRV pilot valve discs.



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

(See NUREG-1022, R.3 for instruction and guidance for completing this form
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Energy Industry Identification System (EIS) codes are identified in the text as [XX].

Introduction

Initial Conditions

At the time the condition was identified, Unit 2 was in Mode 1 at 87 percent of rated power and was increasing in power after a preplanned control rod improvement evolution.

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 three 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 2017 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 June 5, 2017, test results were reported to BSEP. The test results showed that three of the 11 valves actuated at pressures outside of the +/-3 percent tolerance allowed by TS 3.4.3. 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 1098	1140	1244	+9.1
S/N 1109	1130	1227	+8.6
S/N 1106	1150	1208	+5.0

Event Cause

The change in SRV lift setpoints resulted from corrosion bonding between the discs and seats of the pilot valves. Corrosion bonding between the pilot disc and seat is an inherent problem with the two-stage SRV



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design used at Brunswick. Brunswick mitigates corrosion bonding of SRVs by coating each pilot disc surface with platinum to prevent oxygen from interacting with the underlying Stellite. The integrity of the platinum coating is critical to mitigating corrosion bonding. In SRV pilots 1106 and 1109, the platinum coating was degraded in large areas of the pilot disc. The coating was degraded because adhesion to the underlying Stellite was not optimal. Adhesion was less than optimal because a recently devised surface preparation method (i.e., precision grinding to minimize micro-cracking) had not yet been implemented at the time these SRVs were built.

On SRV pilot 1098, extensive steam erosion changed the geometry of the pilot disc. The altered geometry required additional steam pressure to develop sufficient force to overcome the set pressure spring. The change in geometry likely resulted in wedging of the disc into the seat. Steam erosion occurred because the pilot was leaking for a significant portion of the cycle.

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 analyzed per Engineering Change (EC) 409048. The analysis compares each of the 11 SRVs in its as-found condition to the most limiting case addressed in the Brunswick Unit 2 Cycle 22 Reload Safety Analysis Report (RSAR). EC 409048 shows that every SRV opened in its as-found state at a pressure lower than at least one valve in the RSAR analysis. Since each as-found SRV was bounded by the opening pressures assumed in the analysis, the overall RSAR analysis bounds the overall as-found condition of the SRVs. The peak steam dome pressure would therefore not reach the plant safety limit of 1325 psig even in the worst-case analyzed transient.

Therefore, it is concluded that 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

All the SRV pilot assemblies were replaced with certified spares during the spring 2017, Unit 2 refueling outage.

Procedure OCM-VSR509, "Main Steam Relief Valves Target Rock Model 7567 Air Operators and Pilot Assembly Disassembly, Inspection, and Reassembly," has been revised to reduce the probability of disc surface micro-cracks during SRV rebuild. The SRVs currently installed in Unit 1 and Unit 2 have been prepared with this revised procedure.



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Previous Similar Events

In the past three years, two Licensee Event Reports have been submitted to the NRC describing events in which SRVs have been found with setpoint drift which made the valves inoperable.

05000325 / 2014-005, dated July 21, 2014 (ADAMS Accession Number ML14212A031)

05000324 / 2015-002, Revision 1, dated June 26, 2015 (ADAMS Accession Number ML15196A033)

In these events, the causes of corrosion bonding were analyzed, and corrective actions were implemented in subsequent groups of SRVs being rebuilt. However, the platinum coating process is still being advanced. Previous corrective actions could not benefit from improvements which were developed later.

Commitments

This report contains no new regulatory commitments.