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10 CFR 50.73

November 17, 2020
Serial: RA-20-0326

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

Subject: Brunswick Steam Electric Plant, Unit No. 1
Renewed Facility Operating License No. DPR-71
Docket No. 50-325
Licensee Event Report 1-2020-002, Revision 1

Reference: Brunswick, Unit 1, LER 1-2020-002, "Technical Specification Required Shutdown due to Unidentified Leakage," Revision 0, May 18, 2020, ADAMS Accession Number ML20140A004

In accordance with the Code of Federal Regulations, Title 10, Part 50.73, Duke Energy Progress, LLC, is submitting the enclosed Revision 1 to Licensee Event Report (LER) 1-2020-002 (i.e., Reference). This revision provides the results of the completed cause evaluation.

This document contains no regulatory commitments.

Please refer any questions regarding this submittal to Ms. Sabrina Salazar, Manager – Nuclear Support Services, at (910) 832-3207.

Sincerely,

John A. Krakuszeski

SBY/sby

Enclosure: Licensee Event Report 1-2020-002, Revision 1

cc (with enclosure):

Ms. Laura Dudes, NRC Regional Administrator, Region II
Mr. Andrew Hon, NRC Project Manager
Mr. Gale Smith, NRC Senior Resident Inspector
Chair - North Carolina Utilities Commission

NRC FORM 366 (08-2020) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2023

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, Library, and Information Collections Branch (T-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk ail: oira_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

LICENSEE EVENT REPORT (LER)

(See Page 3 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/)

1. Facility Name	2. Docket Number	3. Page
Brunswick Steam Electric Plant (BSEP), Unit 1	05000325	1 OF 3

4. Title

Technical Specification Required Shutdown due to Unidentified Leakage

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Revision No.	Month	Day	Year	Facility Name	Docket Number
03	24	2020	2020	- 002 -	01	11	17	2020		05000
									Facility Name	Docket Number
										05000

9. Operating Mode	10. Power Level
1	022

11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: *(Check all that apply)*

10 CFR Part 20	☐ 20.2203(a)(2)(vi)	☐ 50.36(c)(2)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(A)	**10 CFR Part 73**
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.69(g)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(4)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☒ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(i)	**10 CFR Part 21**	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(1)(i)
☐ 20.2203(a)(2)(ii)	☐ 21.2(c)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(i)
☐ 20.2203(a)(2)(iii)	**10 CFR Part 50**	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)	☐ 73.77(a)(2)(ii)
☐ 20.2203(a)(2)(iv)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)	
☐ 20.2203(a)(2)(v)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)	

☐ **OTHER** (Specify here, in abstract, or NRC 366A).

12. Licensee Contact for this LER

Licensee Contact	Phone Number (Include area code)
Sabrina Salazar, Manager – Nuclear Support Services	(910) 832-3207

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable to IRIS		Cause	System	Component	Manufacturer	Reportable to IRIS
B	SB	RV	T020	Y						

14. Supplemental Report Expected		15. Expected Submission Date	Month	Day	Year
☒ No	☐ Yes (If yes, complete 15. Expected Submission Date)				

16. Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)

At 12:05 Eastern Daylight Time on March 24, 2020, with Unit 1 in Mode 1, at approximately 22% power, coming out of a refueling outage, a Technical Specification required shutdown was initiated due to increased drywell leakage. The reactor was shutdown in accordance with normal shutdown procedures. Reactor water level reached low level 1 (LL1) following the shutdown. Per design, the LL1 signal resulted in automatic actuation of the Primary Containment Isolation System with closure of Group 2, 6, and 8 isolation valves. The shutdown was uncomplicated and all control rods inserted as expected.

The increased drywell leakage was a result of an intermediate-position failure of Safety Relief Valve '1F' in conjunction with opening of the associated vacuum breaker. The cause of this failure was determined to be susceptibility of the Target Rock two stage Safety Relief Valve design to fretting wear of the main disc stem to piston connection when the associated main body is subjected to a high number of cycles during testing, resulting in displacement of the piston and galling in the main body piston guide. Safety Relief Valve '1F' pilot and main valve were replaced and retested upon restart from the reactor shutdown.

There was no impact on the health and safety of the public or plant personnel. This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(A) due to the completion of a Technical Specification required shutdown, and 10 CFR 50.73(a)(2)(iv)(A) due to valid actuation of the Primary Containment Isolation System.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

(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/)

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Brunswick Steam Electric Plant (BSEP), Unit 1	05000- 325	2020	- 002	- 01

NARRATIVE

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

Background

Initial Conditions

At the time of the event, Unit 1 was in Mode 1 (i.e., Power Operation), at approximately 22 percent rated thermal power.

Reportability Criteria

This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(A) because a Technical Specification required shutdown was completed. Technical Specification Action 3.4.4.A, Unidentified Reactor Coolant System (RCS) [AD] leakage increase not within limit, requires RCS leakage to be reduced to within limits within 8 hours. The shutdown was required because the leakage would not have been reduced to within limits within the required Technical Specification Completion Time.

In addition, this event is being reported in accordance with 10 CFR 50.73(a)(2)(iv)(A) because it involved actuation of a system listed in 10 CFR 50.73(a)(2)(iv)(B). Specifically, the Primary Containment Isolation System [JM] actuated during this event.

The NRC was notified of this event per 10 CFR 50.72(b)(2)(i) and 10 CFR 50.72(b)(3)(iv)(A) via Event Notification 54603 at 16:02 Eastern Daylight Time (EDT) on March 24, 2020.

Event Description

At approximately 03:24 EDT on March 24, 2020, during startup testing, main steam [SB] Safety Relief Valve (SRV) '1F' was provided an open signal from the control room. Tailpipe temperature trends indicated that the pilot valve opened, but that the main disc failed to properly reposition to complete the cycle. Thus, the pilot valve remained open and passed steam via the tailpipe to the suppression pool. Troubleshooting and other startup testing were ongoing when, at approximately 10:50 EDT, the control room received unexpected indication of 1.6 gallons per minute (gpm) unidentified leakage in the drywell. At approximately 11:54 EDT, a reading of 3.75 gpm was obtained, exceeding the Technical Specification limit of 2 gpm change in unidentified leakage within 24 hours while in Mode 1. As a result, at 12:05 EDT a Technical Specification required shutdown was initiated.

The reactor was shutdown in accordance with normal shutdown procedures. Reactor water level reached low level 1 (LL1) following the shutdown. The LL1 signal caused Group 2 (i.e., floor and equipment drain isolation valves), Group 6 (i.e., monitoring and sampling isolation valves), and Group 8 (i.e., shutdown cooling isolation valves) isolations. The LL1 isolations occurred as designed; the Group 8 valves were closed at the time of the event.

The shutdown was uncomplicated and all control rods inserted as expected. The SRV '1F' pilot valve reseated with lowering reactor pressure following the shutdown.

Event Cause

The unidentified leakage was determined to be coming from the SRV '1F' pilot valve through its associated vacuum breaker. The SRV '1F' pilot valve was open because SRV '1F' main body did not open during SRV testing. With the main body stuck shut, the discharge pressure would not lower to the pilot valve reseat pressure to allow it to shut. The SRV '1F' vacuum breaker had remained closed until drywell purge was secured as part of startup activities, at which time the pressure difference between the SRV '1F' discharge line and the drywell caused the vacuum breaker to unseat and steam flow from the open SRV '1F' pilot valve diverted to the Drywell. Unit shutdown resulted in pressure reduction to the pilot valve reseat pressure and the pilot valve closed, terminating the source of unidentified leakage.

The cause of this intermediate-position failure of SRV '1F' was determined to be susceptibility of the Target Rock two stage SRV design to fretting wear of the main disc stem to piston connection when the associated main body is subjected to a high number of cycles during testing, resulting in displacement of the piston and galling in the main body piston guide.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Brunswick Steam Electric Plant (BSEP), Unit 1	05000- 325	2020	- 002	- 01

NARRATIVE

Safety Assessment

There was no adverse impact on the health and safety of the public. The safety significance of this event is minimal. The reactor was shutdown in accordance with plant procedures and all safety related systems operated as designed.

Corrective Actions

The vacuum breaker associated with SRV '1F' was inspected and confirmed to be operating properly. SRV '1F' pilot and main valve were replaced and retested upon restart from the reactor shutdown.

While there is no specified design limit provided by Target Rock for the number of cycles of a two stage SRV main body, and no consistent industry standard for limiting main body cycles, engineering judgement was applied to vendor information for a similar Target Rock SRV design, and a threshold of 24 cycles was established for considering an SRV at risk for damage by this failure mode. All other Unit 1 SRVs were confirmed to be below this threshold.

In addition to the aforementioned completed corrective actions, the following corrective actions are currently planned.

- Five SRVs on Unit 2 have been identified with main bodies that have been cycled during testing 24 or more times.
  - The four SRVs with the most cycles will be replaced in the 2021 refueling outage.
  - The other SRV with greater than 24 cycles will be replaced in the 2023 refueling outage.

  All five of these SRVs were lifted with no issues as part of testing during startup from the 2019 refueling outage, thereby providing confidence in their continued operation. Regarding the SRV that will remain installed until the 2023 refueling outage, additional confidence in its acceptability is provided based on it having an improved flex piston design and being replaced on an accelerated schedule.

Any changes to corrective actions or completion schedules will be made in accordance with the site's corrective action program.

Previous Similar Events

No events have occurred within the past three years in which increased drywell leakage from an SRV failure resulted in a LER.

Commitments

No regulatory commitments are contained in this report.