DUKE ENERGY®

William R. Gideon
Vice President
Brunswick Nuclear Plant
P.O. Box 10429
Southport, NC 28461
o: 910.457.3698

DEC 0 5 2016

10 CFR 50.73

Serial: BSEP 16-0103

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

Subject: Brunswick Steam Electric Plant, Unit Nos. 1 and 2
Renewed Facility Operating License Nos. DPR-71 and DPR-62
Docket Nos. 50-325 and 50-324
Licensee Event Report 1-2016-005

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,

William R. Gideon

SWR/swr

Enclosure: Licensee Event Report 1-2016-005

IE22
NRR

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

U. S. Nuclear Regulatory Commission
ATTN: Ms. Michelle P. Catts, NRC Senior Resident Inspector
8470 River Road
Southport, NC 28461-8869

U. S. Nuclear Regulatory Commission
ATTN: Mr. Andrew Hon (Mail Stop OWFN 8G9A) **(Electronic Copy Only)**
11555 Rockville Pike
Rockville, MD 20852-2738
Andrew.Hon@nrc.gov

Chair - North Carolina Utilities Commission **(Electronic Copy Only)**
4325 Mail Service Center
Raleigh, NC 27699-4300
swatson@ncuc.net

NRC FORM 366 (06-2016) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2018

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 e-mail to 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.

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/)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Brunswick Steam Electric Plant (BSEP) Unit 1	05000325	1 OF 4

4. TITLE

Drywell High Range Radiation Monitors Inoperable due to Thermally Induced Current Phenomenon

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
									Brunswick Unit 2	05000324
10	03	2016	2016	- 005	- 00	12	05	2016	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	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
100	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(i)
	☐ 20.2203(a)(2)(vi)	☑ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
		☐ 50.73(a)(2)(i)(C)	☐ OTHER Specify in Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT	TELEPHONE NUMBER *(Include Area Code)*
Lee Grzeck, Manager - Regulatory Affairs	(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

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☑ NO				

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On October 3, 2016, Units 1 and 2 were in Mode 1 (i.e., Run mode) at 100 percent of rated thermal power. At that time, Engineering personnel were reviewing the plant response to NRC Information Notice 97-45, Supplement 1, on signal cables for the Drywell High Range Radiation Monitors (DWHRRMs). These cables are susceptible to thermally induced current (TIC), which can degrade the accuracy of DWHRRMs. The review resulted in DWHRRMs being declared inoperable on both units. The DWHRRMs were included in Technical Specifications (TS) Limiting Condition for Operation (LCO) 3.3.3.1 beginning in 1984. As a result of the TIC effect on the DWHRRM cables, BSEP Unit 1 and Unit 2 have operated longer than the TS allowed completion times for inoperable DWHRRMs. This event is reportable per 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by the plant TSs. The event resulted from the inherent characteristics of the cables and DWHRRMs. An existing site procedure directs the use of alternate indications for assessment of drywell or fuel cladding conditions, and this procedure will remain in place as a compensatory action. Corrective actions will include replacing the cables on a schedule to be developed after assessment of available options.

NARRATIVE

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

Background

Initial Conditions

On October 3, 2016, Unit 1 and Unit 2 were both in Mode 1 (i.e., Run mode) at 100 percent of rated thermal power. No out-of-service equipment contributed to, or affected the course of, this event.

Reportability Criteria

This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) because Units 1 and 2 were operated in a condition prohibited by the Technical Specifications (TS). Specifically, both units' Drywell High Range Radiation Monitors (DWHRRMs) [IP] were declared inoperable due to signal cables which can degrade the accuracy of the DWHRRMs. With the DWHRRMs inoperable, a Special Report should have been submitted to the NRC within 14 days per TS 3.3.3.1, Condition F. The requirement to submit a Special Report has been in effect since 1984 following issuance of License Amendments 73 and 99 for Units 1 and 2, respectively. The Special Report was not submitted because the DWHRRMs were not previously recognized as inoperable. Therefore, the plant was operated in a condition prohibited by the TS. In accordance with 10 CFR 50.4(e), this event is being reported by LER only, and a Special Report is not required.

Event Description

On October 3, 2016, Engineering personnel were re-assessing signal cables for the DWHRRMs. These cables are susceptible to a phenomenon known as thermally induced current (TIC). During transient conditions, TIC can result in connected radiation monitors temporarily not meeting the accuracy requirements of Regulatory Guide (RG) 1.97, Revision 2, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident." Per RG 1.97, Table 1, note 7, DWHRRMs must be accurate to within a factor of 2. The cables installed in both units at BSEP were previously assumed to be bounded by analysis of Rockbestos cables addressed in Electric Power Research Institute (EPRI) Technical Report 110379, "High Range Radiation Monitor Cable Study: Phase 1." It was assumed that the materials in use at BSEP have essentially the same dielectric properties and thermal response as those tested by EPRI. Based on the reported behavior of those materials, calculations predicted that TIC-induced inaccuracy in the DWHRRMs at BSEP would not result in significant impact.

Re-assessment of the previous analysis at BSEP cast doubt on the earlier conclusion. The BSEP cables use an insulation material that was not tested by EPRI, and no rigorous basis supported the assumption that the dielectric properties and thermal response would be the same. Engineering personnel, therefore, determined that the previous conclusion about the acceptability of cables used at BSEP lacked sufficiently rigorous justification. This was reported to Operations personnel via Condition Report 2066681. Both BSEP Unit and Unit 2 DWHRRMs were conservatively declared inoperable.

Event Causes

During accident conditions, cables exposed to rapidly changing temperatures can produce electrical currents large enough to cause false indications of high radiation. The TIC phenomenon was made known to the nuclear power industry via NRC Information Notice 97-45, Supplement 1, "Environmental Qualification Deficiency for Cables and Containment Penetration Pigtails." BSEP's initial assessment concluded that the effect of TIC upon the DWHRRMs was too small to appreciably affect their performance in a design basis accident. A new review cast doubt on that conclusion because documentation of the initial assessment contained no rigorous basis for the assumption that BSEP's cables were bounded by those tested by EPRI. Therefore, the DWHRRMs were conservatively declared inoperable.

Safety Assessment

The purpose of the DWHRRMs is to provide operators with indication of radiation conditions inside the primary containment following an accident. Radiation conditions, in turn, are used to assess the integrity of the fuel cladding and provide input for emergency action levels (EALs) to classify a plant emergency.

The affected monitors would continue to function despite their susceptibility to TIC, but could indicate radiation levels higher than actual if cables were exposed to increasing temperatures, or lower than actual if cables were exposed to decreasing temperatures. Radiation indications would be inaccurate only during times when temperature in the drywell was rapidly changing. When temperature changes in the drywell grew smaller or stopped, inaccuracy in the DWHRRMs would diminish or vanish entirely. During times when the accuracy of the DWHRRMs might appear questionable, alternative methods of assessing the condition of the fuel are available to operators as provided in existing plant procedure 0PLP-37, "Equipment Important to Emergency Preparedness and ERO Response." The DWHRRMs do not control any other structures, systems, or components.

Based on this analysis, this event had no adverse impact on the health and safety of the public.

Corrective Actions

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

An already-existing site procedure, 0PLP-37 (referenced above), provides alternate indications for the DWHRRMs for assessment of drywell or fuel cladding conditions. This procedure will remain in place as a preplanned alternate method until a permanent resolution is implemented.

The subject cables will be replaced with cables less susceptible to TIC. The replacement schedule will be developed following assessment of available options.

NARRATIVE

Previous Similar Events

No events have occurred in the past three years in which instrumentation was found to be inoperable due to a unique physics phenomenon such as TIC.

Commitments

This report contains no new regulatory commitments.