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ONS-2016-104

10 CFR 50.73

December 16, 2016

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

Duke Energy Carolinas, LLC (Duke Energy)  
Oconee Nuclear Station (ONS), Units 1, 2 and 3  
Docket Nos. 50-269, 50-270, and 50-287  
Renewed License Nos. DPR-38, DPR-47, and DPR-55  
Action Request No.: 02069527

Subject: Licensee Event Report 269/2016-002, Revision 0 - Containment High Range Radiation Monitors Inoperable Due to Potential Thermally Induced Current Effects

The enclosed Licensee Event Report (LER) describes the discovery of inoperable Containment High Range Radiation Monitors due to the potential effects of thermally induced currents during a high energy line break event in a Penetration Room. It was determined that the inoperable condition had existed longer than the time allowed by the Technical Specification (TS) applicable to the Containment High Range Radiation Monitors with no TS actions taken. These conditions constitute an "operation or condition prohibited by Technical Specifications" as described by 10 CFR 50.73(a)(2)(i)(B), thus requiring an LER to be submitted.

There are no regulatory commitments associated with this LER.

If you have any questions regarding this submittal, please contact Sam Adams, Oconee Regulatory Affairs, at 864-873-3348.

Sincerely,

Thomas D. Ray  
Vice President,  
Oconee Nuclear Station

Enclosure:

LER 269/2016-002: Containment High Range Radiation Monitors Inoperable Due to Potential Thermally Induced Current Effects.

IE22  
NRR

DESIGNATE AS ORIGINAL  
JAMES R. HALL 2/17/2017 JH

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cc :

Ms. Catherine. Haney  
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Mr. Eddy Crowe  
NRC Senior Resident Inspector  
Oconee Nuclear Station

INPO (Word File via E-mail)

**Enclosure:**

**LER 269/2016-002: Containment High Range Radiation Monitors  
Inoperable Due to Potential Thermally Induced Current Effects.**

<b>NRC FORM 366</b> (06-2016)		<b>U.S. NUCLEAR REGULATORY COMMISSION</b>			<b>APPROVED BY OMB: NO. 3150-0104</b>		<b>EXPIRES: 10/31/2018</b>																						
		<b>LICENSEE EVENT REPORT (LER)</b> (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 <a href="mailto:Infocollections.Resource@nrc.gov">Infocollections.Resource@nrc.gov</a> , 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.																								
(See NUREG-1022, R.3 for instruction and guidance for completing this form <a href="http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/">http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/</a> )																													
<b>1. FACILITY NAME</b> Oconee Nuclear Station, Unit 1					<b>2. DOCKET NUMBER</b> 05000269		<b>3. PAGE</b> 1 of 4																						
<b>4. TITLE</b> Containment High Range Radiation Monitors Inoperable Due to Potential Thermally Induced Current Effects																													
<b>5. EVENT DATE</b>			<b>6. LER NUMBER</b>			<b>7. REPORT DATE</b>			<b>8. OTHER FACILITIES INVOLVED</b>																				
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV. NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER																			
10	25	2016	2016	002	0	12	16	2016	Oconee Nuclear Station, Unit 2	05000270																			
									FACILITY NAME	DOCKET NUMBER																			
									Oconee Nuclear Station, Unit 3	05000287																			
<b>9. OPERATING MODE</b>										<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>																			
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<b>12. LICENSEE CONTACT FOR THIS LER</b>																													
<b>LICENSEE CONTACT</b> Sam Adams, Regulatory Affairs, Senior Nuclear Engineer										<b>TELEPHONE NUMBER (Include Area Code)</b> (864) 873-3348																			
<b>13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT</b>																													
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX																				
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<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input type="checkbox"/> YES (If yes, complete 15. Expected Submission Date)										<input checked="" type="checkbox"/> NO																			
										<b>15. EXPECTED SUBMISSION DATE</b>					MONTH	DAY	YEAR												
<b>ABSTRACT</b> (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)																													
<p>On October 25, 2016, the Containment High Range Radiation Monitors (CHRRMs) for each unit were declared inoperable as they could not meet the accuracy requirements of Regulatory Guide (RG) 1.97 for Type E post-accident monitoring (PAM) instrumentation. Oconee Nuclear Station (ONS) Engineering determined that a High Energy Line Break (HELB) in the East Penetration Room of each Unit could cause a false high reading on the CHRRMs RIA-57 and RIA-58 for that Unit. The false high reading would be due to the potential for Thermally Induced Currents (TIC) to affect the accuracy of the radiation monitor readings as discussed in NRC Information Notice 97-45, Supplement 1.</p> <p>This condition existed for as long as the CHRRMs were installed with none of the actions required in Technical Specification (TS) 3.3.8 taken. Therefore the Completion Times of TS 3.3.8 were exceeded and the condition is reportable under 10 CFR 50.73(a)(2)(i)(B) as plant operation prohibited by Technical Specifications.</p> <p>ONS will review Fleet and Industry Operating Experience when determining the best path forward for restoring operability of the CHRRMs.</p>																													

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

1. FACILITY NAME	2. DOCKET	6. LER NUMBER		
Oconee Nuclear Station, Unit 1	05000269	YEAR	SEQUENTIAL NUMBER	REV NO.
		2016	- 002	- 00

**NARRATIVE**BACKGROUND

On February 17, 1998, the NRC issued Information Notice (IN) 97-45, Supplement 1, to alert licensees of the potential of erratic indications from high-range radiation monitors as a result of a problem with the associated coaxial cables. The IN describes that these erratic indications could mislead operators assessing radiation levels in the containment building during accident scenarios. The erratic indications result from positive and negative current flow when detector cables are exposed to transient temperature conditions, such as those postulated during a loss-of-coolant accident or a main steamline break. This phenomenon is known as thermally induced current (TIC), and could result in false high radiation readings.

At ONS, the aforementioned TIC issue is only a concern for a HELB in the East Penetration Room. It is worth noting that it is beyond the ONS design and licensing basis to postulate a HELB outside of containment that would result in an actual high containment radiation condition.

The physical configuration and arrangement of the CHRRMs [RIT] detectors are such that the detectors are located in modified electrical penetrations in the containment wall with the cables located in the East and West Penetration Rooms external to containment. As such, none of the detector cables are exposed to temperature transients resulting from events that occur within containment. Since these cables are not exposed to the temperature transients that could occur inside containment, there are no TIC concerns that could cause inaccurate CHRRMs indications during an event inside containment. The existing accuracy calculation for the CHRRMs determined that the CHRRMs meet the RG 1.97 accuracy requirements for Post-Accident Monitoring (PAM) instrumentation for events inside containment. Thus, RIA-57 and RIA-58 are fully able to meet their designated safety functions as defined by TS 3.3.8 and the UFSAR for events inside containment, including a Loss of Coolant Accident (LOCA).

However, on October 25, 2016, it was determined that the CHRRMs were inoperable as they could not meet the accuracy requirements of RG 1.97 for Type E PAM instrumentation during a HELB event in the East Penetration Room (outside containment). This condition has existed for as long as the CHRRMs were installed with none of the actions required in TS 3.3.8 taken. Therefore the Completion Times of TS 3.3.8 were exceeded and the condition is reportable under 10 CFR 50.73(a)(2)(i)(B) as plant operation prohibited by Technical Specifications.

At the time this condition was identified, Oconee Units 1, 2, and 3 were all operating in Mode 1 at approximately 100% power. There were no structures, systems or components out of service at the time of this event that contributed to this event. No change in plant mode or reactor power occurred on any unit as a result of the conditions described within this report.

EVENT DESCRIPTION

ONS Engineering determined that a HELB event in the East Penetration Room of each Unit could cause a false high reading on the CHRRMs for that Unit. The false high reading would be due to the potential TIC effects on the accuracy of the radiation monitor readings as discussed in IN 97-45, Supplement 1.

On October 25, 2016, CHRRMs RIA-57 and RIA-58 were declared inoperable on all three ONS Units due to the aforementioned TIC effects. The TIC effect could cause the CHRRMs to experience spurious indication spikes. The indication spikes would likely result in exceeding the RG 1.97 accuracy requirements for these post-accident monitors during the temperature transient. This deficiency does not

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**NARRATIVE**

allow for the CHRRMs to accurately monitor the release of radioactive material, as required by UFSAR Section 7.5.1.3 for RG 1:97 Type E Instrumentation. This condition is only manifested during HELB conditions in the East Penetration Room. CHRRMs response under other event scenarios is as designed.

The CHRRMs are part of the Area Radiation Monitoring System [IL]. They are PAM instrumentation specifically designed to detect radiation levels in the containment building of their associated unit to allow for assessment of conditions related to fission product barrier status (Reactor Coolant System and fuel cladding barriers) and to assess the potential for a radioactive release to the public when one or more of these barriers are failed, along with a release path from the containment building to the outside atmosphere. The CHRRMs are used as one of several diverse methods for evaluating emergency action levels for the Loss of RCS Barrier, Loss of Fuel Clad Barrier and for the Potential Loss of Primary Containment Barrier in the Emergency Plan.

The potentially impacted components are the Rockbestos type RSS-6-104/LE coaxial cables [CBL1] associated with the CHRRMs.

**CAUSAL FACTORS**

In AR 2069527, a concern was raised by recent Fleet and Industry OE suggesting that the original Oconee Nuclear Station (ONS) evaluation in response to Information Notice IN 97-45, "Environmental Qualification Deficiency for Cables and Containment Penetration Pigtailes" may have been inadequate. Re-evaluation of the TIC issue revealed that ONS had not previously addressed the impact to the CHRRMs' indications given an event within the East Penetration Room that would lead to the monitors' signal cables being exposed to thermal transients. A thermal transient, with an increasing temperature in the penetration rooms associated with a HELB event in the East Penetration Room (external to the Reactor Building), would create a momentary high radiation level reading for the CHRRMs when no actual increase in Reactor Building radiation level is present.

**CORRECTIVE ACTIONS****Completed Actions:**

On October 13, 2016, the concern with potential TIC effects was communicated with licensed operators, along with the distribution of an Operations Guide to each ONS Control Room, reinforcing that an evaluation of the conditions in the Penetration Rooms should be made prior to making E-plan declarations based on the indications provided by 1,2,3RIA-57 and/or 1,2,3RIA-58 during a HELB event affecting the penetration rooms. Additionally, the OPS Guide reinforces that operators must validate conditions using alternate indications.

On November 15, 2016, a 14-day Special Report as required by TS 5.6.6 for two Inoperable CHRRMs channels was submitted to the NRC (ML16323A189).

**Planned Actions:**

Preliminary reviews indicate that replacing the coaxial cable for the CHRRMs will not completely resolve the TIC concern. Further research into fleet and industry operating experience will be conducted to consider other viable options, including potential licensing changes. Based on the findings of the additional research, an implementation schedule will be developed and the operability of the CHRRMs will be restored within the next two refueling outages for each unit.

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**NARRATIVE****SAFETY ANALYSIS**

The aforementioned TIC issue is only a concern for a HELB in the East Penetration Room. It is beyond the ONS design and licensing basis to postulate a HELB outside of containment that would result in an actual high containment radiation condition. Thus, although inoperable, RIA-57 and RIA-58 are considered available to fully perform their intended function under all conditions with the exception of a HELB in the East Penetration room and, as such, provide reliable assessment capability for design basis events involving the failure of the RCS and/or fuel barriers and their potential to contribute to a release of radioactivity to the outside atmosphere.

The CHRRMs provide only a monitoring function with an alarm in the Control Room. They do not provide any specific control actions and do not provide an actuation signal for other equipment. These monitors do not perform a specific function in mitigating the consequences of an accident and are not modeled in the Oconee Probabilistic Risk Assessment (PRA).

While the CHRRMs are inoperable, they remain fully available along with other diverse methods for evaluating Emergency Action Levels within the Emergency Plan. This event had no significant impact on the health and safety of the public.

**ADDITIONAL INFORMATION**

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

**SIMILAR EVENTS**

There are no known previous similar events at ONS.