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January 23, 2018

U.S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, D.C. 20555-0001

Subject: Duke Energy Carolinas, LLC (Duke Energy)  
Catawba Nuclear Station, Unit 2  
Docket Number 50-414  
Special Report 2018-01 for the Unit 2 Loose Parts Monitoring System  
Non-Functional for Greater than 30 Days

In accordance with Required Action A.2 of the Catawba Nuclear Station Selected Licensee Commitment (SLC) 16.7-4, "Loose-Part Detection System," enclosed is Special Report 2018-01 concerning an occurrence of the Unit 2 Loose Parts Monitoring System having a Collection Region which was non-functional for a period of greater than 30 days. SLC 16.7-4 states that if all channels of one or more Loose-Part Collection Region(s) are non-functional for greater than 30 days, then prepare and submit a Special Report to the Commission outlining the cause of the malfunction and the plans for restoring the channel(s) to FUNCTIONAL status within 40 days.

This occurrence is considered to be of no significance with respect to the health and safety of the public. There are no new regulatory commitments contained in this letter.

Questions on this special report should be directed to Sherry Andrews at 803-701-3424.

Sincerely,

A handwritten signature in black ink that reads "Tom Simril". The signature is fluid and cursive, with the first name "Tom" and last name "Simril" clearly distinguishable.

Tom Simril  
Vice President, Catawba Nuclear Station

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xc:

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## BACKGROUND

Catawba Nuclear Station Units 1 and 2 each have a Loose Parts Monitoring System (LPMS) in order to meet Regulatory Guide 1.133, Rev 1, as described in the UFSAR.

The LPMS is an electronic system that monitors the Reactor Coolant System for metal-to-metal impacts in the primary coolant loop. Accelerometer sensors are mounted at various collection regions on the exterior surfaces of the upper reactor vessel, lower reactor vessel, reactor coolant pumps, and steam generators. The signal information from these sensors are amplified and then routed out of containment to the LPMS cabinet mounted in the Control Room.

Selected Licensee Commitment (SLC) 16.7-4 "Loose-Part Detection System" requires at least one channel in a Collection Region to be functional when in Modes 1 and 2. The SLC defines a Loose-Part Collection Region as "an area within the reactor coolant system where loose parts can possibly collect and which is monitored by the Loose-Part Detection System." The SLC identifies these Collection Regions as:

- 1) Lower reactor vessel (3 SLC sensor channels)
- 2) Upper reactor vessel (3 SLC sensor channels)
- 3) Primary side of steam generator A (2 SLC sensor channels)
- 4) Primary side of steam generator B (2 SLC sensor channels)
- 5) Primary side of steam generator C (2 SLC sensor channels)
- 6) Primary side of steam generator D (2 SLC sensor channels)

The SLC states the secondary side of all the steam generator and the reactor coolant pump channels each have one non-SLC sensor channel which are not part of a Collection Region required by Regulatory Guide 1.133.

Each steam generator (S/G) has two SLC channels on the primary side and one non-SLC channel on the secondary side. The sensor channel locations are physically located close to each other, and if one detects a loose part, it is expected that the other channels in that area would also detect the loose part, regardless of the channel being SLC or non-SLC related. Since the secondary side channel is specifically excluded from the Collection Region, there are only two channels per S/G SLC required collection region. If one SLC steam generator channel fails, only the remaining SLC channel can be used to meet the SLC.

Operators perform a channel check of each Collection Region channel every 24 hours per SLC Surveillance (TR) 16.7-4-1. Operators listen to each channel during the audio check on night shift per the Mode 1 Periodic Surveillance Items procedure.

Maintenance performs a monthly channel functional test to satisfy SLC TR 16.7-4-2, 16.7-4-3, and 16.7-4-4. The channel functionality is verified by reviewing the preamp bias voltage trend, signal trend screens, and listening to the audio monitor. The alarm function is verified by generating a noise spike on a channel and verifying both the Control Room annunciator and plant computer alarm.

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## DESCRIPTION OF OCCURRENCE

The Unit 2 LPMS does not meet SLC requirements for the 2D Steam Generator Collection Region.

For the 2D Steam Generator, the sensor channels are:

- Channel 20 - 2D S/G Secondary (non-SLC)
- Channel 21 - 2D S/G Manway (SLC)
- Channel 22 - 2D S/G Hot Leg (SLC)

Channel 22 (SLC) was declared non-functional on 1/31/17. Channel 22 was declared non-functional due to a failed component located inside containment (the sensor, preamp, or interconnecting wiring).

Channel 21 (SLC) was declared non-functional on 12/18/17. During the monthly channel functional test for the Unit 2 LPMS, the bias voltage on Channel 21 (SLC) was not a steady value as expected. The channel's bias voltage was failing intermittently. The bias voltage source is associated with the channel's preamp which is located inside containment. The preamp bias voltage is necessary for the channel to be functional (detect sound). The loss of bias voltage does not cause a control room annunciator therefore Operations does not receive indication that the channel has lost functionality.

Therefore, both channels of the 2D Steam Generator SLC required Collection Region are non-functional and cannot be repaired prior to a Unit 2 outage. Each channel's location of repair is in a high radiation dose area located inside containment that is inaccessible to personnel during online conditions. The next Unit 2 refueling outage is scheduled for March 2018.

Channel 20 (non-SLC) for the 2D S/G secondary side has been placed into single channel mode. It is expected that the Unit 2 LPMS will still detect a loose part in the 2D SG Collection Region with the non-SLC required Secondary Channel 20.

## CAUSE OF THE NON-FUNCTIONALITY

The non-functionality is caused by one of the components inside containment is failing or making intermittent connections for both Channels 21 and 22. The components inside containment include the sensor, the preamp, and the interconnecting wiring (terminations). The specific component failure cannot be determined until the components are accessible during the next Unit 2 outage.

## CORRECTIVE ACTIONS

1. Channel 20 (non-SLC) for the 2D Steam Generator secondary side was placed into single channel mode (it is expected that the Unit 2 LPMS will still detect a loose part in the 2D SG Collection Region).
2. Repair and restore functionality for Channel 21 (SLC) for the 2D Steam Generator during the next Unit 2 refueling outage (scheduled for March 2018).
3. Repair and restore functionality for Channel 22 (SLC) for the 2D Steam Generator during the next Unit 2 refueling outage (scheduled for March 2018).