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

Subject: Duke Energy Carolinas, LLC (Duke Energy)
Catawba Nuclear Station, Units 1 and 2
Docket Numbers 50-413 and 50-414
Special Report 2017-01 for the Units 1 and 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," attached is Special Report 2017-01 concerning an occurrence of the Units 1 and 2 Loose Parts Monitoring System having Collection Regions which were 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,

Tom Simril

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Attachment

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Attachment
Catawba Nuclear Station, Units 1 and 2
Special Report 2017-01

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" states the requirements of the LPMS. SLC 16.7-4 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 lists the Collection Regions:

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 generators and reactor coolant pumps channels (each having 1 non-SLC sensor channel) are not in a Collection Region required by Regulatory Guide 1.133.

Each steam generator has two SLC and one non-SLC sensor channels. The sensor channel locations are 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. Because the steam generator channels located on secondary side are excluded from the Collection Region, if one SLC steam generator channel fails, only the remaining SLC channel can be used to meet the SLC.

As described in the LPMS User Manual, the LPMS uses a feature called Single Channel Alarm Inhibit (SCA Inh) to reduce false alarms on the system. This feature prevents an event from being reported if only a single channel alarms. This method is based on the assumption that any true loose part would trigger more than one sensor. This feature requires more than one channel to meet the alarm criteria at the same time in order for the LPMS to generate a Control Room alarm. This feature can be activated or overridden on a per channel basis by user-specified settings. The default is that SCA Inh is active. Therefore, if only one SLC channel is active in a Collection Region, in order for the channel to be considered functional per the SLC, that channel's SCA Inh Override must be selected so that the LPMS will trigger an alarm with only one SLC channel alarm from that Collection Region.

A channel check is performed every 24 hours per SLC Surveillance 16.7-4-1 of each Collection Region channel. The audio check is performed each night shift per the Mode 1 Periodic Surveillance Items procedure.

DESCRIPTION OF OCCURRENCE

The Unit 1 LPMS did not meet SLC requirements for the 1C Steam Generator Collection Region from 12/23/15 to 3/16/17.

For the 1C Steam Generator, the sensor channels are:
Channel 7 - 1C S/G Manway (SLC)
Channel 8 - 1C S/G Hot Leg (SLC)
Channel 16 - 1C S/G Secondary (non-SLC)

Channel 8 (SLC) for the 1C S/G region was disabled on 12/23/15 due to a problem on the channel. This resulted in the 1C S/G region having one SLC and one non-SLC channel active. While this is sufficient for the Unit 1 LPMS to detect a loose part in this region, this does not meet SLC requirements. Channel 7 (SLC) would need the SCA Inh Override setting enabled to meet SLC requirements to allow the single active SLC channel to alarm. This was performed on 3/16/17. During this time, it is expected that the Unit 1 LPMS would have detected a loose part in that area due to the non-SLC required Secondary Channel 16 in the area remaining functional. Also, the nightly audio channel checks did not observe any unusual noises during this time.

The Unit 1 LPMS did not meet SLC requirements for the 1A Steam Generator Collection Region from 2/18/16 to 3/16/17.

For the 1A Steam Generator, the sensor channels are:
Channel 9 - 1A S/G Manway (SLC)
Channel 10 - 1A S/G Hot Leg (SLC)
Channel 18 - 1A S/G Secondary (non-SLC)

Channel 9 (SLC) for the 1A S/G region was disabled on 2/18/16 due to a problem on the channel. Channel 18 (non-SLC) for the 1A S/G region was also disabled during this time due to a previous modification to a circuit card. With both of these channels disabled, only Channel 10 (SLC) was active for the 1A S/G region, and required the SCA Inh Override setting enabled to be able to detect loose parts in the region. The Override setting was enabled on 3/16/17. During this time, the nightly audio checks did not detect any unusual noises. Additionally, the LPMS has not detected a loose part on Channel 10 after activation of the SCA Inh Override on 3/16/17. Therefore, there is no concern of an unidentified loose part in this region.

The Unit 2 LPMS did not meet SLC requirements for the 2D Steam Generator Collection Region from 11/14/16 to 3/16/17.

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)

On 11/14/16, Channel 21 (SLC) developed a problem which was discovered 11/16/16 during monthly channel functional test. The channel was disabled per procedure. On 3/7/17, Channel 22 (SLC) developed a field problem and was disabled per procedure. On 3/9/17, the problem on Channel 21 cleared, and the channel was re-enabled. When both of these channels were disabled, the system was not able to detect loose parts in the 2D S/G region. When only one of these channels was disabled, the system could detect a loose part in this region, but the SCA Inh Override setting would need to be enabled to meet SLC requirements. The Override setting was enabled on 3/16/17. With the exception of the time period between 3/7/17 and 3/9/17, it is expected that the Unit 2 LPMS would have detected a loose part in the 2D SG Collection Region due to the non-SLC required Secondary Channel 20 in the area remaining functional. Also, the nightly audio channel checks did not observe any unusual noises.

CAUSE OF THE NON-FUNCTIONALITY

For both Units 1 and 2, a legacy deficiency was identified with the Loose Parts Monitoring System Channel Functional Test procedure on 3/14/17. The procedure did not provide guidance to activate the Single Channel Alarm Inhibit (SCA Inh) Override in the case of only one SLC channel active in a region. In addition, the procedure allowed all SLC channels in a region to be disabled (Unit 2 SLC Channels 21 and 22 were both disabled from 3/7/17 to 3/9/17).

CORRECTIVE ACTIONS

1) The Loose Parts Monitoring System Channel Functional Test procedure was updated to include instructions for the following:
    a. Direction to activate Single Channel Alarm Inhibit Override, if the channel in question is the only SLC channel in a region, or when disabling a collection channel.
    b. Steps to prevent all SLC channels in a region from being inadvertently disabled.
    c. Additional guidance for monthly testing to ensure that if a channel has its SCA Inh Override enabled, it remains enabled after testing is complete. Testing currently enables and disables SCA Inh Override as part of the testing, and the new instructions prevent this setting from accidentally being changed.
2) Restore Units 1 and 2 LPMS to functionality:
    a. After the Loose Parts Monitoring System Channel Functional Test procedure was updated, the SCA Inh Override feature was enabled for Unit 1 Channels 7 and 10, and Unit 2 Channel 21 on 3/16/17.
    b. Portions of the procedure were used as a functional test to ensure the channels would alarm as expected.