



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 20, 2017

OMB Control No. 3150-0231

Mr. Kelvin Henderson
Senior Vice President
Nuclear Corporate
Duke Energy
526 South Church Street, EC-07H
Charlotte, NC 28202

SUBJECT: BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2; SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1; AND MCGUIRE NUCLEAR STATION, UNITS 1 AND 2 – REQUESTS FOR SUPPLEMENTAL INFORMATION REGARDING GENERIC LETTER 2016-01, “MONITORING OF NEUTRON-ABSORBING MATERIALS IN SPENT FUEL POOLS” (CAC NOS. MF9920, MF9452, MF9437, MF9919, AND MF9432; EPID L-2016-LRC-0001)

Dear Mr. Henderson:

On April 7, 2016, the U.S. Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 2016-01, “Monitoring of Neutron-Absorbing Materials in Spent Fuel Pools” (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16097A169), to address the degradation of neutron-absorbing materials (NAMs) in wet storage systems for reactor fuel at power and non-power reactors.

GL 2016-01 requested that licensees provide information to allow the NRC staff to verify continued compliance through effective monitoring to identify and mitigate any degradation or deformation of NAMs credited for criticality control in spent fuel pools.

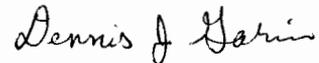
To facilitate each licensee’s response, GL 2016-01 established four categories (Category 1, Category 2, Category 3, and Category 4). Categories 1, 2, and 3 were established to identify situations where a detailed response to the GL 2016-01 would not be required. The categorization criteria were generally based on situations where a licensee does not credit NAMs for criticality control, or if a licensee has, or will soon have, an approved monitoring program for NAMs in the plant technical specifications or as a license condition. A full description of the categories can be found in Enclosure 1.

Duke Energy Progress, LLC, and Duke Energy Carolinas, LLC (Duke Energy, the licensee) submitted a letter dated October 31, 2016 (ADAMS Accession Nos. ML16306A036), providing information in response to GL 2016-01. Enclosure 2 provides a list of Duke Energy plants in Category 4, the incoming letters’ Accession numbers, and Cost Activity Code (CAC) numbers.

To complete its review, the NRC staff requests the licensee provide the supplemental information requested in Enclosures 3, 4, and 5. During an interaction with your staff on November 2, 2017, it was agreed that you would provide a response by May 31, 2018.

If you have any questions, please contact Dennis Galvin of my staff at (301) 415-6256 or Dennis.Galvin@nrc.gov.

Sincerely,



Dennis J. Galvin, Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-325, 50-324, 50-369,
50-370, and 50-400

Enclosures:

1. List of GL 2016-01 Categories
2. List of Plants, Incoming Letters, and CAC numbers
3. Request for Supplemental Information
Brunswick Steam Electric Plant, Units 1 and 2
4. Request for Supplemental Information
Shearon Harris Nuclear Power Plant, Unit 1
5. Request for Supplemental Information
McGuire Nuclear Station, Units 1 and 2

cc: Listserv

LIST OF GENERIC LETTER (GL) 2016-01 CATEGORIES

- Category 1: Power reactor addressees that do not credit neutron-absorbing materials other than soluble boron in the analysis of record (AOR). In some cases, no neutron-absorbing material is present in the spent fuel storage racks, and in other cases, credit for the neutron-absorbing material has been removed through a regulatory action (e.g., approved license amendment). Those addressees may submit a response letter confirming that no neutron-absorbing materials are currently credited to meet NRC subcriticality requirements in the spent fuel pool (SFP).
- Category 2: Power reactor addressees that have an approved license amendment to remove credit for existing neutron-absorbing materials and that intend to complete full implementation no later than 24 months after the issuance of this GL. Licensees may request extensions to this implementation timeframe if there are extenuating circumstances. Those addressees may submit a response letter affirming that they will implement the approved license amendment request within the specified time. However, they must still provide information equivalent to Category 3 or Category 4 for any other neutron-absorbing material credited in the SFP criticality AOR after the license amendment has been fully implemented.
- Category 3: Power reactor addressees that have incorporated their neutron-absorbing material monitoring programs into their licensing basis through an NRC-approved Technical specification (TS) change or license condition. Those addressees may submit a response letter referencing their approved TS change or license condition and affirming that no change has been made to their neutron-absorbing material monitoring program, as described in the referenced license amendment request. If a change has been made since NRC approval of the reference, the response letter should also describe any such changes. (Licensees with a monitoring program approved as part of a license amendment request or license renewal application that was not incorporated as a TS change or license condition are considered to belong in Category 4.)
- Category 4: All other power reactor addressees. The NRC seeks information in five areas depending upon the type of neutron absorber material used by the licensee in the SFP.

LIST OF PLANTS, INCOMING LETTERS,
AND COST ACTIVITY CODE (CAC) NUMBERS

Plant	Incoming Letter (ADAMS Accession No.)	CAC Nos.
Brunswick Steam Electric Plant, Units 1 and 2	ML16306A036	MF9920 MF9452
Shearon Harris Nuclear Power Plant, Unit 1	ML16306A036	MF9437
McGuire Nuclear Station, Units 1 and 2	ML16306A036	MF9919 MF9432

REQUEST FOR SUPPLEMENTAL INFORMATION

DUKE ENERGY PROGRESS, LLC

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2

DOCKET NOS. 50-325 AND 50-324

In a letter dated October 31, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16306A036), Duke Energy Progress, LLC, and Duke Energy Carolinas, LLC (Duke Energy, the licensee) provided information in response to the Generic Letter 2016-01, "Monitoring of Neutron Absorbing Materials in Spent Fuel Pools" (ADAMS Accession No. ML16097A169) for Brunswick Steam Electric Plant, Units 1 and 2 (BSEP). The U.S. Nuclear Regulatory Commission (NRC) staff requests the following information to complete its review.

Generic Boral-RAI-1

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.68, "Criticality accident requirements," and General Design Criterion (GDC) 62, "Prevention of Criticality in Fuel Storage and Handling," provide the requirements for licensees to maintain sub-criticality in the spent fuel pool (SFP). For licensees that utilize neutron-absorbing materials (NAM) in the SFP, the boron-10 (^{10}B) areal density (AD) of the NAM must be known so that the assumption for the ^{10}B minimum AD in the SFP nuclear criticality safety (NCS) analysis of record (AOR) is supported. In order for the NRC staff to verify that the requirements of 10 CFR 50.68 and GDC 62 are met, the staff needs to ensure that licensees are taking appropriate action to confirm that the ^{10}B AD of their NAM can reasonably be expected to remain above the minimum assumed in the SFP NCS AOR. In addition, the condition of the NAM must be considered in the SFP NCS AOR. In order to verify whether or not the requirements of 10 CFR 50.68 and GDC 62 will be met, the staff needs to verify that the potential reactivity changes due to degradation or physical changes to the NAM are accounted for in the SFP NCS AOR. This includes any changes that would affect the neutron spectrum for the SFP in addition to any loss of neutron attenuation capability.

Industry operating experience, as described in Information Notices 2009-26, "Degradation of Neutron-Absorbing Materials in the Spent Fuel Pool" (ADAMS Accession No. ML092440545) and 1983-29, "Fuel Binding Caused by Fuel Rack Deformation" (ADAMS Accession No. ML14043A291) has demonstrated that certain manufacturing processes and plant conditions (dose, chemistry, length of time installed, and installation configuration) have resulted in material deformation as a result of blisters or bulging associated with Boral.

BSEP does not have a site-specific monitoring program, and consequently, is relying on general industry operating experience as a surrogate for the condition of the Boral installed in the SFP.

- a. Please describe how industry operating experience bounds the condition of the Boral at BSEP, thereby providing assurance that any degradation or deformation that may affect the Boral at BSEP is identified.

- b. In addition, please discuss the criticality impact due to relevant material deformation identified in general industry operating experience, and how it can be accommodated by the NCS AOR for BSEP without exceeding NRC subcriticality requirements.

REQUEST FOR SUPPLEMENTAL INFORMATION

DUKE ENERGY PROGRESS, LLC

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1

DOCKET NO. 50-400

In a letter dated October 31, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16306A036), Duke Energy Progress, LLC, and Duke Energy Carolinas, LLC (Duke Energy, the licensee) provided information in response to the Generic Letter (GL) 2016-01, "Monitoring of Neutron Absorbing Materials in Spent Fuel Pools" (ADAMS Accession No. ML16097A169) for Shearon Harris Nuclear Power Plant, Unit 1 (HNP). The U.S. Nuclear Regulatory Commission (NRC) staff requests the following information to complete its review.

Plant-Specific Monitoring Information

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.68, "Criticality accident requirements," and General Design Criterion (GDC) 62, "Prevention of Criticality in Fuel Storage and Handling," provide the requirements for licensees to maintain sub-criticality in the spent fuel pool (SFP). For licensees that utilize neutron-absorbing materials (NAM) in the SFP, the boron-10 (^{10}B) areal density (AD) of the NAM must be known so that the assumption for the ^{10}B minimum AD in the SFP nuclear criticality safety (NCS) analysis of record (AOR) is supported. In order for the NRC staff to verify that the requirements of 10 CFR 50.68 and GDC 62 are met, the staff needs to ensure that licensees are taking appropriate action to confirm that the ^{10}B AD of their NAM can reasonably be expected to remain above the minimum assumed in the SFP NCS AOR. In addition, the condition of the NAM must be considered in the SFP NCS AOR. In order to verify whether or not the requirements of 10 CFR 50.68 and GDC 62 will be met, the staff needs to verify that the potential reactivity changes due to degradation or physical changes to the NAM are accounted for in the SFP NCS AOR. This includes any changes that would affect the neutron spectrum for the SFP in addition to any loss of neutron attenuation capability.

Industry operating experience, as described in Information Notices 2009-26, "Degradation of Neutron Absorbing Materials in the Spent Fuel Pool" (ADAMS Accession No. ML092440545) and 1983-29, "Fuel Binding Caused by Fuel Rack Deformation" (ADAMS Accession No. ML14043A291) has demonstrated that certain manufacturing processes and plant conditions (dose, chemistry, length of time installed, and installation configuration) have resulted in material deformation as a result of blisters or bulging associated with Boral.

HNP-1 In the response to Question 2)a) of GL 2016-01 regarding racks using Boral, Duke Energy describes the monitoring of Boral coupons for one set of racks but then states there is currently not a commitment to have a Boral coupon monitoring program. Regarding the several racks using Boral at HNP that do not have coupons installed specifically for those racks, the response states that coupons installed under EC package 95-00278 are used as an indicator of neutron absorber performance. In addition, the response states, "Industry operating experience is used to assess impact on neutron absorber material [Boral]."

For racks using Boral:

1. Clarify whether the Boral coupon monitoring described in the response is an ongoing program used to confirm that the credited neutron-absorbing material is performing its safety function.
2. Describe how the combination of surrogate coupons, and industry operating experience, is used to inform the condition of the Boral given that there does not appear to be a formal Boral monitoring program in place, and only one set of coupon data is available.
3. Describe how the surrogate coupons are representative (or bounding) of the other racks given the coupons were installed 6 years after one rack, and some of the racks hold different fuel types that may subject the Boral to different conditions in the SFP.

This information is requested to provide assurance that any degradation or deformation that may affect the Boral at HNP is detected.

In addition, please discuss the criticality impact due to relevant material deformation identified in general industry operating experience, and how it can be accommodated by the NCS AOR for HNP without exceeding NRC subcriticality requirements.

REQUEST FOR SUPPLEMENTAL INFORMATION

DUKE ENERGY CAROLINAS, LLC

MCGUIRE NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-369 AND 50-370

In a letter dated October 31, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16306A036), Duke Energy Progress, LLC, and Duke Energy Carolinas, LLC (Duke Energy, the licensee) provided information in response to the Generic Letter (GL) 2016-01, "Monitoring of Neutron Absorbing Materials in Spent Fuel Pools" (ADAMS Accession No. ML16097A169) for McGuire Nuclear Station, Units 1 and 2 (MNS). The U.S. Nuclear Regulatory Commission (NRC) staff requests the following information to complete its review.

Plant-Specific Monitoring Information

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.68, "Criticality accident requirements," and General Design Criterion (GDC) 62, "Prevention of Criticality in Fuel Storage and Handling," provide the requirements for licensees to maintain sub-criticality in the spent fuel pool (SFP). For licensees that utilize neutron-absorbing materials (NAM) in the SFP, the boron-10 (^{10}B) areal density (AD) of the NAM must be verified so that the assumption for the ^{10}B minimum AD in the SFP nuclear criticality safety (NCS) analysis of record (AOR) is supported. In order for the NRC staff to verify that the requirements of 10 CFR 50.68 and GDC 62 are met, the staff needs to ensure the programs in place to monitor the condition of the NAM in the SFP are appropriate for their intended purpose. By evaluating the programs that monitor the condition of the NAM in the SFP, the NRC staff will be able to determine whether or not the requirements of 10 CFR 50.68 and GDC 62 will be met. In addition, the condition of the NAM must be considered in the SFP NCS AOR. In order to verify whether or not the requirements of 10 CFR 50.68 and GDC 62 will be met, the staff needs to verify that the potential reactivity changes due to degradation or physical changes to the NAM are accounted for in the SFP NCS AOR.

MNS-1. The Duke Energy response to Question (2) in GL 2016-01 states that MNS only performs visual examinations of the Boral coupons in the SFP (i.e., no physical measurements or neutron attenuation testing).

Describe how the visual examinations provide assurance that the Boral material has not lost attenuation capability, ^{10}B content, weight, or density.

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