



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

November 7, 2017

To Those on the Attached List

**SUBJECT:** FENOC FLEET-BEAVER VALLEY POWER STATION, UNIT NOS. 1 AND 2;  
DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1; AND PERRY  
NUCLEAR POWER PLANT, UNIT NO. 1 – GENERIC LETTER 2016-01,  
“MONITORING OF NEUTRON-ABSORBING MATERIALS IN SPENT FUEL  
POOLS” – FIRSTENERGY NUCLEAR OPERATING COMPANY – REQUEST  
FOR SUPPLEMENTAL INFORMATION (EPID L-2016-LRC-0001)

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.

The 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 if 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 (TS) or as a license condition. A full description of the categories can be found in Enclosure 1.

Enclosure 2 provides a list of GL 2016-01 responses by plant. To complete its review, the NRC staff requests the licensee provide the supplemental information requested in Enclosures 3 through 5. During a discussion with your staff on November 7, 2017, it was agreed that you would provide a response by close of business on May 31, 2018.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter and Enclosures 1 and 2 will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's ADAMS which is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

Sincerely,



Bhalchandra K. Vaidya, Project Manager,  
Plant Licensing Branch III  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-334, 50-412, 50-346,  
and 50-440

Enclosures:

1. List of GL 2016-01 Categories
2. List of Plants, Incoming Letters, and CAC numbers (old)
3. Request for Supplemental Information  
Beaver Valley Power Station, Unit 1
4. Request for Supplemental Information  
Davis-Besse Nuclear Power Station, Unit 1
5. Request for Supplemental Information  
Perry Nuclear Power Plant, Unit 1

cc w/enclosures: ListServ

TO THOSE ON THE ATTACHED LIST DATED NOVEMBER 7, 2017

Mr. Samuel L. Belcher  
Senior Vice President and Chief Nuclear Officer  
FirstEnergy Nuclear Operating Company  
341 White Pine Drive  
Akron, OH 44320

Beaver Valley Power Station, Unit No. 1 with Enclosure 3  
FirstEnergy Nuclear Operating Company  
Docket No. 50-334  
License No. NPF-73

Mr. Richard D. Bologna Mr. David B. Hamilton  
Site Vice President  
FirstEnergy Nuclear Operating Company  
Mail Stop A-PY-A290  
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Shippingport, PA 15077

Davis-Besse Nuclear Power Station, Unit 1 with Enclosure 4  
FirstEnergy Nuclear Operating Company  
Docket No. 50-346  
License No. NPF-3

Mr. Brian D. Boles  
Site Vice President  
FirstEnergy Nuclear Operating Company  
Mail Stop A-DB-3080  
5501 North State, Route 2  
Oak Harbor, OH 43449-9760

Perry Nuclear Power Plant, Unit 1 with Enclosure 5  
FirstEnergy Nuclear Operating Company  
Docket No. 50-440  
License No. NPF-58

Mr. David B. Hamilton  
Site Vice President  
FirstEnergy Nuclear Operating Company  
Mail Stop A-PY-A290  
P.O. Box 97, 10 Center Road  
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## LIST OF 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 (NAM) is present in the spent fuel storage racks, and in other cases, credit for the NAM has been removed through a regulatory action (e.g., approved license amendment). Those addressees may submit a response letter confirming that no NAMs 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 NAMs and that intend to complete full implementation no later than 24 months after the issuance of this Generic Letter. 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 (LAR) within the specified time. However, they must still provide information equivalent to Category 3 or Category 4 for any other NAM credited in the SFP criticality AOR after the license amendment has been fully implemented.
- Category 3: Power reactor addressees that have incorporated their NAM 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 NAM monitoring program, as described in the referenced LAR. 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 LAR 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, CAC NUMBERS, AND EPID**

<b>Plant</b>	<b>Incoming Letter (ADAMS Accession No.)</b>	<b>CAC Nos.</b>	<b>EPID</b>
Beaver Valley Power Station, Unit 1	ML16305A344	MF9457	L-2016-LRC-0001
Davis-Besse Nuclear Power Station, Unit 1	ML16307A074	MF9443	L-2016-LRC-0001
Perry Nuclear Power Plant, Unit 1	ML16294A072	MF9425	L-2016-LRC-0001

REQUEST FOR SUPPLEMENTAL INFORMATION

FIRSTENERGY NUCLEAR OPERATING COMPANY

BEAVER VALLEY POWER STATION, UNIT 1

DOCKET NO. 50-334

In a letter dated October 31, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16305A344), FirstEnergy Nuclear Operating Company (FENOC, the licensee) provided information in response to the Generic Letter 2016-01 for Beaver Valley Power Station, Unit 1 (BVPS). The U.S. Nuclear Regulatory Commission (NRC) staff requests the following information is needed in order to complete its review.

**Generic Boral-RAI-2**

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 with regards to maintaining subcriticality in the spent fuel pool (SFP). For licensees that utilize neutron absorbing materials (NAM) in the SFP, the properties of the NAM must be known so that the assumptions in the SFP nuclear criticality safety (NCS) analysis of record (AOR) are supported. In order to verify whether or not the requirements of 10 CFR 50.68 and GDC 62 will be met, the NRC 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 Notice 2009-26, "Degradation of Neutron-Absorbing Materials in the Spent Fuel Pool," (ADAMS Accession No. ML092440545) 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 associated with Boral.

BVPS has indicated that similar operating experience was identified as a result of their site-specific monitoring program. Please discuss the criticality impact due to the material deformation identified at BVPS, and how it can be accommodated by the nuclear criticality safety AOR at BVPS without exceeding NRC subcriticality requirements.

REQUEST FOR SUPPLEMENTAL INFORMATION  
FIRSTENERGY NUCLEAR OPERATING COMPANY  
DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1  
DOCKET NO. 50-346

In a letter dated November 1, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16307A07), FirstEnergy Nuclear Operating Company (FENOC, the licensee) provided information in response to the Generic Letter 2016-01 for Davis-Besse Nuclear Power Station, Unit 1 (DBNPS). The U.S. Nuclear Regulatory Commission (NRC) staff requests the following information is needed in order to complete its review.

**Generic Boral-RAI-2**

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 with regards to maintaining subcriticality in the spent fuel pool (SFP). For licensees that utilize neutron absorbing materials (NAM) in the SFP, the properties of the NAM must be known so that the assumptions in the SFP nuclear criticality safety (NCS) analysis of record (AOR) are supported. In order to verify whether or not the requirements of 10 CFR 50.68 and GDC 62 will be met, the NRC 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 Notice 2009-26, "Degradation of Neutron-Absorbing Materials in the Spent Fuel Pool," (ADAMS Accession No. ML092440545) 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 associated with Boral.

DBNPS has indicated that similar operating experience was identified as a result of their site-specific monitoring program. Please discuss the criticality impact due to the material deformation identified at DBNPS, and how it can be accommodated by the nuclear criticality safety AOR at DBNPS without exceeding NRC subcriticality requirements.

**Plant-Specific Monitoring Information**

Regulation 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 with regards to maintaining subcriticality in the SFP. For licensees that utilize neutron absorbing materials (NAM) in the SFP, the <sup>10</sup>B areal density (AD) of the NAM must be verified so that the assumption for the <sup>10</sup>B minimum AD in the SFP criticality analysis 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 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.

**DBNPS-1.** In the response to Question (2)a)iii), the licensee states that "acceptance criteria are based on confirming the  $^{10}\text{B}$  AD assumed in the SFP criticality analysis." The information provided in response to Question (1)e)ii) is unclear with regards to the specific value used for  $^{10}\text{B}$  AD in the nuclear criticality safety analysis of record.

Provide the specific value for the  $^{10}\text{B}$  AD acceptance criterion used in the monitoring program.



REQUEST FOR SUPPLEMENTAL INFORMATION

FIRSTENERGY NUCLEAR OPERATING COMPANY

PERRY NUCLEAR POWER PLANT, UNIT 1

DOCKET NO. 50-440

In a letter dated October 19, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16294A072), FirstEnergy Nuclear Operating Company (FENOC, the licensee) provided information in response to the Generic Letter 2016-01 for Perry Nuclear Power Plant, Unit 1 (PNPP). The U.S. Nuclear Regulatory Commission (NRC) staff requests the following information is needed in order 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 with regards to maintaining subcriticality in the spent fuel pool (SFP). For licensees that utilize neutron absorbing materials (NAMs) in the SFP, the  $^{10}\text{B}$  areal density (AD) of the NAM must be known so that the assumption for the  $^{10}\text{B}$  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  $^{10}\text{B}$  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.

PNPP 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 spent fuel pool.

- a. Please describe how industry operating experience bounds the condition of the Boral at PNPP, thereby, providing assurance that any degradation or deformation that may affect the Boral at PNPP 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 nuclear criticality safety AOR for PNPP without exceeding NRC subcriticality requirements

### **Plant-Specific Monitoring Information**

Regulation 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 with regards to maintaining sub-criticality in the SFP. For licensees that utilize (NAMs) in the SFP, the <sup>10</sup>B AD of the NAM must be verified so that the assumption for the <sup>10</sup>B minimum AD in the SFP criticality analysis is supported. In order for the NRC staff to verify 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.

**PNPP-1** In response to Question (1) (a) of the Generic Letter (GL) 2016-01, the licensee states that the SFP racks were initially installed in 1982 and were then "...subsequently removed, cleaned, and reinstalled in September – October 1984."

Given the changing environmental the SFP racks were exposed to (e.g., removal, cleaning, environmental changes), how does the licensee have assurance that no unexpected degradation or deformation of the Boral material has occurred (e.g., blistering, bulging, loss of neutron attenuation capability/<sup>10</sup>B, weight, dimensional, density, material loss, etc.)?

SUBJECT: FENOC FLEET-BEAVER VALLEY POWER STATION, UNIT NOS. 1 AND 2; DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1; AND PERRY NUCLEAR POWER PLANT, UNIT NO. 1 – GENERIC LETTER 2016-01, “MONITORING OF NEUTRON-ABSORBING MATERIALS IN SPENT FUEL POOLS” – FIRSTENERGY NUCLEAR OPERATING COMPANY – REQUEST FOR SUPPLEMENTAL INFORMATION (EPID L-2016-LRC-0001) DATED NOVEMBER 7, 2017

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**(\*\*) No change in email from S. Wall**

OFFICE	NRR/DORL/LPL3/PM	NRR/DORL/LSPB/PM	NRR/DORL/LPL3/LA
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DATE	09/25/17	09/22/17	09/21/17
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DATE	11/07/17	11/07/17	

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