

Dominion Energy Nuclear Connecticut, Inc.  
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DominionEnergy.com



November 29, 2018

U.S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555

Serial No. 18-403  
NRA/SS R0  
Docket No. 50-423  
License No. NPF-49

**DOMINION ENERGY NUCLEAR CONNECTICUT, INC.**  
**MILLSTONE POWER STATION UNIT 3**  
**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION FOR PROPOSED**  
**TECHNICAL SPECIFICATIONS CHANGES FOR SPENT FUEL POOL STORAGE**  
**AND NEW FUEL STORAGE**

By letter dated May 3, 2018, Dominion Energy Nuclear Connecticut, Inc. (DENC) requested Nuclear Regulatory Commission (NRC) approval of the proposed Technical Specifications (TS) changes for Millstone Power Station Unit 3 for spent fuel pool storage and new fuel storage. In an email dated October 18, 2018, the NRC transmitted a request for additional information (RAI) related to the TS change request. The attachment to this letter provides DENC's response to the NRC's RAI.

If you have any questions regarding this submittal, please contact Shayan Sinha at (804) 273-4687.

Sincerely,

Gerald T. Bischof  
Senior Vice President – Nuclear Operations & Fleet Performance

COMMONWEALTH OF VIRGINIA  
COUNTY OF HENRICO

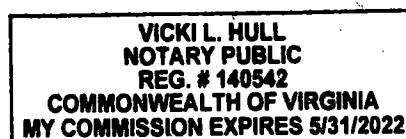
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The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Gerald T. Bischof, who is Senior Vice President - Nuclear Operations & Fleet Performance of Dominion Energy Nuclear Connecticut, Inc. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 29<sup>TH</sup> day of November, 2018.

My Commission Expires: 5-31-22

Vicki L. Hull  
Notary Public



ADD  
NR

Attachment: Response to Request for Additional Information for Proposed Technical Specification Changes for Spent Fuel Pool Storage and New Fuel Storage

Commitments made in this letter: DENC will revise the Updated FSAR to follow the Boral coupon testing schedule requirements in NEI 16-03 following end of Cycle (EOC) 21.

cc: U.S. Nuclear Regulatory Commission  
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**ATTACHMENT**

**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION FOR PROPOSED  
TECHNICAL SPECIFICATION CHANGE FOR SPENT FUEL STORAGE AND NEW  
FUEL STORAGE**

**MILLSTONE POWER STATION 3  
DOMINION ENERGY NUCLEAR CONNECTICUT, INC.**

By letter dated May 3, 2018, Dominion Energy Nuclear Connecticut, Inc. (DENC) requested Nuclear Regulatory Commission (NRC) approval of the proposed TS changes for Millstone Power Station Unit 3 for spent fuel storage and new fuel storage. In an email dated October 18, 2018, the NRC transmitted a request for additional information (RAI) related to the request. This attachment provides DENC's response to the RAI.

### **RAI –MCCB-1**

*Part 50.68(b)(4) of Title 10 of the Code of Federal Regulations (10 CFR) states, in part, that "...the  $k_{\text{eff}}$  of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95..." In order to demonstrate that  $k_{\text{eff}}$  doesn't exceed 0.95, the licensee submitted its SFP criticality analysis, for MPS3, as part of its LAR dated May 3, 2018. This analysis, in part, takes credit for the neutron absorbing properties of the Boral material installed in the SFP racks.*

*In its LAR, the licensee referenced its response to request for additional information (RAI) letter dated November 22, 2017, related to Generic Letter 2016, "Monitoring of Neutron-Absorbing Materials in Spent Fuel Pools", (ADAMS Accession No. ML17338A057), to provide information regarding the Boral monitoring program at MPS3. In the RAI response, the licensee noted that it had discovered weight loss with an unknown cause in its Boral coupons since their installation in 2000. In addition, the licensee stated that it did not discover any degradation that would impact SFP criticality. In order to have reasonable assurance that the weight loss has not impacted the SFP criticality, the NRC staff has the following questions:*

- a) Has the weight loss caused any dimensional changes (e.g. length, width, or thickness) in the Boral coupons?*
- b) Has there been any decrease in Boron 10 (B-10) areal density (AD) in the coupons?*
- c) Provide any corrective actions taken to mitigate the degradation of the Boral material, and describe how these actions are meant to mitigate, or account for any impacts to the SFP criticality analysis due to the weight loss of the Boral coupons.*

## **DENC Response**

- a) There have been no significant changes to the length or width of the coupons. The thickness has decreased to varying degrees. Table 1 below shows the average dimensional changes of the coupon measurements to date relative to the as-built measurements for each coupon.

**Table 1: Percent Change to the Dimensions of the BORAL Coupons**

Year of Measurement	Weight	Length <sup>1</sup>	Width <sup>1</sup>	Thickness <sup>2</sup>
2003	-1.4%	-0.1%	-0.1%	-0.7%
2004	-1.9%	-0.1%	-0.2%	0.3%
2005	-2.7%	-0.2%	-0.2%	-0.2%
2008	-4.4%	-0.1%	-0.1%	-3.3%
2013	-6.1%	-0.2%	-0.2%	-3.0%
2017	-5.8%	-0.2%	-0.2%	-1.3%

<sup>1</sup>Average of three measurement locations along the coupon.

<sup>2</sup>Average of five measurement locations on the coupon.

- b) The coupons have shown no indication that the B-10 areal density (AD) has decreased. Table 2 shows the measured B-10 AD.

**Table 2: Percent Change to the B-10 AD of the BORAL Coupons**

Year of Measurement	B-10 AD
2003	1.6%
2004	0.9%
2005	-4.1%*
2008	-2.8%*
2013	-5.6%*
2013 Reevaluation	1.6%*
2017	1.1%

\*As previously discussed in DENC's response to the RAls for Generic Letter 2016-01 (ADAMS Accession No. ML17338A057), the 2013 coupon's areal density was reevaluated based on the vendor's newer and more accurate chemical analysis of the BORAL standards. This reevaluation changed the B-10 AD from 0.0302 g/cm<sup>2</sup> to 0.0325 g/cm<sup>2</sup> compared to an as-built value of 0.0320 g/cm<sup>2</sup>. The 2005 and 2008 measurements used the same chemical analysis of the standards as the 2013 measurement and thus, had the same issue. With the more accurate calibrations, these coupon measurements do not indicate that B-10 AD is being lost.

c) DENC does not currently consider that the weight loss in the BORAL coupons is of immediate concern based on three factors:

- (1) The weight loss is occurring slowly in comparison to the measurement interval.
- (2) It is unclear whether the weight loss phenomenon is also occurring to the BORAL in the SFP racks.
- (3) The effect of losing the aluminum clad is small and already quantified in the submitted criticality analysis.

These factors are further explained as follows:

1. The 2017 coupon measurement leveled off the weight loss trend. However, conservatively ignoring the 2017 measurement, the trend shows a weight loss of about 0.5% per year. The aluminum clad surrounding the B<sub>4</sub>C cermet accounts for about 22% of the BORAL mass. If the pre-2017 trend continued, it would take 32 more years until the B<sub>4</sub>C cermet is exposed to the SFP water environment. The coupon measurement interval is much shorter than 32 years (See DENC's response to RAI-MCCB-2 below). Therefore, the weight loss phenomenon is occurring slowly enough that DENC will be able to detect the weight loss trend if it recommences and enact mitigating corrective actions before the B<sub>4</sub>C cermet is exposed to the SFP environment.
2. Prior to the 2017 measurement, the BORAL coupons were not encased in stainless steel wrappers whereas the BORAL panels in the SFP racks are encased. A Condition Report was written regarding the coupon weight loss trend. One of the Corrective Actions to address the cause of the weight loss is to investigate whether storing BORAL coupons fully exposed to the SFP environment on the coupon tree is contributing to the weight loss, possibly by allowing physical interaction with the tree structure or storage cell. To determine whether the absence of wrappers contributes to the coupon weight loss trend, the remaining coupons were encased in stainless steel sheaths in April 2018. Future measurements will determine if the stainless steel wrapper has an effect on the BORAL weight loss.
3. The possible weight loss and thinning of the BORAL in the SFP racks is evaluated in the criticality analysis. Table 9.6, 9.14, and 9.20 of Attachment 5 to the LAR (ML18128A049) shows the uncertainty cases for BORAL thickness. The uncertainty cases remove all of the clad from one side of the BORAL plate for all panels in the pool. Proportionally this is roughly double the amount of weight loss observed to date in the coupons. The SFP k-eff sensitivity to the BORAL thickness is small. For Region 1, the sensitivity is 0.0010 delta k (dk, including statistical uncertainties) compared to the minimum margin to the limit of 0.0079 dk. For Region 2, the sensitivity is 0.0003 dk compared to the minimum margin to the limit of 0.0052 dk. Note that the minimum margin to the limit of the whole LAR is in Region 3 with 0.0049 delta k.

Based on the information presented above, there are no planned corrective actions at this time. It should be noted that if future information challenges the assertions outlined above, then the situation will be reevaluated to determine if corrective actions are needed to mitigate the Boral weight loss.

### **RAI –MCCB-2**

*10 CFR 50.68(b)(4) states, in part, that "...the  $k_{eff}$  of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95...". The MPS3 TS 5.6.1.1, "Fuel Storage – Criticality," ensures the sub-criticality requirements of 10 CFR 50.68(b)(4) are met. The  $k_{eff}$  found in the SFP criticality analysis is used to demonstrate compliance with TS 5.6.1.1. Certain assumptions in the SFP criticality analysis rely on the condition of the Boral neutron-absorbing material. In order to verify the assumed values for certain properties of Boral (Boron-10 areal density, length, width, etc.), the licensee has previously implemented a Boral coupon monitoring program.*

*Because the Boral coupon monitoring program provides assurance, in part, that TS 5.6.1.1 will continue to be met, the NRC staff requires assurance that the coupon monitoring program will not be subject to changes which reduce the effectiveness of the program. Describe how the Boral coupon monitoring program will be controlled (e.g. UFSAR/TS update) to provide assurance that changes reducing the effectiveness of the program will not be made.*

### **DENC Response**

The MPS3 Updated FSAR, Section 9.1.2.3 provides the required BORAL coupon testing schedule which at present extends through the end of Cycle (EOC) 21 (spring 2022). Dominion Energy Nuclear Connecticut has committed to revising the Updated FSAR to follow the Boral coupon testing schedule requirements in NEI 16-03, "Guidance for Monitoring of Fixed Neutron Absorbers in Spent Fuel Pools" following EOC 21. In accordance with NEI 16-03, until the weight loss trend has been arrested, Millstone Unit 3 will test the BORAL coupons approximately every 5 years in accordance with the Millstone procedure for Boral Test Coupons. Revisions to the Updated FSAR are subject to the requirements of 10 CFR Part 50.59.