



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

April 19, 2017

EA-14-094

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

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1 – REQUEST FOR  
ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT  
REQUEST TO ADOPT NATIONAL FIRE PROTECTION ASSOCIATED  
STANDARD 805 (CAC NO. MF7190)

Dear Mr. Boles:

By application dated December 16, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15350A314), as supplemented by letters dated February 2, March 7, July 28, and December 16, 2016, and January 17, 2017 (ADAMS Accession Nos. ML16033A085, ML16067A195, ML16210A422, ML16351A330, and ML17017A504, respectively), FirstEnergy Nuclear Operating Company (the licensee), submitted a license amendment request (LAR) for Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS). The proposed amendment would change the current fire protection program at DBNPS to one based on the National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition, as incorporated into Title 10 of the *Code of Federal Regulations* Section 50.48(c).

The U.S. Nuclear Regulatory Commission staff is reviewing your submittals and has determined that additional information is required to complete the review. A response to the enclosed request for additional information is requested to be provided within 60 days from the date of this letter. This request was discussed with your staff on April 19, 2017.

If you have any questions, please contact me at (301) 415-1380.

Sincerely,

A handwritten signature in black ink, appearing to read "Blake Purnell".

Blake Purnell, Project Manager  
Plant Licensing Branch III  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure: As stated

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION  
LICENSE AMENDMENT REQUEST TO ADOPT  
NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805  
FIRSTENERGY NUCLEAR OPERATING COMPANY  
DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1  
DOCKET NO. 50-346

By application dated December 16, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15350A314), as supplemented by letters dated February 2, March 7, July 28, and December 16, 2016, and January 17, 2017 (ADAMS Accession Nos. ML16033A085, ML16067A195, ML16210A422, ML16351A330, and ML17017A504, respectively), FirstEnergy Nuclear Operating Company (the licensee), submitted a license amendment request (LAR) for Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS). The proposed amendment would change the current fire protection program at DBNPS to one based on the National Fire Protection Association Standard 805 (NFPA 805), "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition, as incorporated into Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.48(c).

The licensee's December 16, 2016, and January 17, 2017, letters were in response to a U.S. Nuclear Regulatory Commission (NRC) request for additional information (RAI) issued on October 18, 2016 (ADAMS Accession No. ML16256A066).

The NRC staff is reviewing the licensee's submittals and has determined that the additional information below is required to complete the review.

**Fire Protection Engineering (FPE) RAI 01.01**

LAR Table B-3, "Nuclear Safety Performance Criteria [NSPC]," identifies an instrument modification to address variance from deterministic requirement (VFDR) DB-2033. In response to FPE RAI 01.c (December 16, 2016), the licensee stated:

DB-2033 will be added to Table S-1. If DB-2036 in Table S-2 concludes the instrumentation in its current condition will remain available after an inadvertent containment spray, then no modification for DB-2033 will be necessary. If modifications are required, then adding DB-2033 to Table S-1 will ensure they are implemented.

LAR Table S-2, "Implementation Items," describes item DB-2036 as an update to documentation, such as system assurance and fire protection engineering software (SAFE), for containment spray modifications and instrumentation.

Enclosure

- a. If the containment spray modifications are new modifications required to meet the NSPC, describe the modifications and revise LAR Attachment S, Table S-1, "Plant Modifications Committed," as appropriate. Otherwise, describe how the modifications will resolve the variance identified in DB-2033.
- b. Specify if the containment spray modifications will meet the NSPC using a deterministic approach or a performance-based approach. If the modifications will be credited as part of a performance-based compliance strategy, discuss how it meets the risk criteria, maintains safety margins, and maintains defense-in-depth. Also, discuss how the modifications will affect the fire risk values in LAR Attachment W for the plant (i.e., core damage frequency and large early release frequency) and the applicable fire areas.

#### **FPE RAI 04.01**

LAR Attachment L, Approval Request 2, states: "Flame spread to adjacent cable trays in high density safety-related areas is also reduced by the use of solid-bottom trays with a layer of ceramic fiber on top." The licensee's, response to FPE RAI 04.b (December 16, 2016) states that cable trays in fire compartment II-01 (turbine building) do not have ceramic fiber on top as originally indicated in LAR Table 4-3.

Describe how an exposure fire that could potentially impact the thermoplastic cables in fire compartment II-01, which does not have the ceramic fiber installed on the top of the trays, will not affect the ability to meet the NSPC and will maintain the safety margins and defense-in-depth, as described in Approval Request 2.

#### **FPE RAI 08.01**

NFPA 805, Section 3.3.7.2, requires outdoor high-pressure flammable gas storage containers to be located so that the long axis is not pointed at buildings. The requirement is to address the potential for the storage tanks "rocketing" and acting as missiles, rather than exposure fire hazards.

In LAR Attachment A1 (p. 46), the licensee stated that the hydrogen and propane storage tanks are oriented with the long axis toward buildings. The licensee stated in the LAR and in response to FPE RAI 08 (December 16, 2016) that it complies with NFPA 805, Section 3.3.7.2, using an existing engineering equivalency evaluation. The licensee's response to FPE RAI 08 indicates that the bases for compliance relies on exceeding safe distance criteria in specified NFPA standards. However, the criteria in the specified NFPA standards are associated with protection from radiant heat based on the storage volume, and do not account for potential missiles generated by the storage tanks.

Address the potential for missiles generated by the hydrogen and propane storage tanks by:

- a. Submitting a performance-based method for NRC approval in accordance with 10 CFR 50.48(c)(2)(vii), include the information described in Regulatory Guide 1.205, Section 2.2.2; or
- b. Demonstrating that the location of the storage tanks relative to the nearest exposed equipment and/or buildings located along the long axis of the tanks is a minimal risk; or

- c. Demonstrating compliance with NFPA 805, Section 3.3.7, based on the location of the storage tanks relative to the nearest exposed equipment and/or buildings located along the long axis of the tanks.

#### **FPE RAI 10**

In the December 16, 2016, and January 17, 2017, letters, the licensee indicated in several RAI responses that it will perform additional engineering equivalency evaluations and may need to make additional plant modifications. In addition, the licensee identified it will provide revisions to several LAR attachments in the future.

Provide the additional changes to the LAR, including changes related to the additional engineering equivalency evaluations and plant modifications.

#### **Safe Shutdown Analysis (SSA) RAI 03.01**

Section 3.5.1.1 of the Nuclear Energy Institute (NEI) document NEI 00-01, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Revision 2, (ADAMS Accession No. ML091770265), states that for ungrounded direct-current circuits, a single hot short from the same source is assumed to occur unless it can be demonstrated that the occurrence of a same-source short is not affected in the fire area. NEI 00-01 further states that multiple shorts-to-ground are to be evaluated for their impact on ungrounded circuits.

In LAR Attachment B, the licensee stated that it "aligns with intent" of NEI 00-01, Section 3.5.1.1. In response to SSA RAI 03 (December 16, 2016), the licensee stated that the methodology for evaluation ungrounded direct-current circuits (described in the LAR) was used for compliance with the 10 CFR 50 Appendix R regulations, and the methodology meets the intent of the guidance in NEI 00-01. However, the licensee further stated that the Appendix R resolution categories described in its RAI response will not be transitioned to the NFPA 805 licensing basis.

Provide the alignment basis and explanation for NEI 00-01, Section 3.5.1.1, for the NFPA 805 program.

#### **SSA RAI 07.01**

In LAR Table G-1, "Davis-Besse Recovery Actions [RAs] and Activities Occurring at the Primary Control Station(s)," the licensee identified three RAs associated with VFDRs that involve the loss of reactor coolant pump (RCP) seal cooling via the seal injection flow path. The licensee stated that within 8 hours, the RAs will involve either manually aligning seal injection flow to all the RCP seals, manually align component cooling water to the RCP thermal barrier or cooling down the reactor coolant system (RCS) to place the plant between 280 degrees Fahrenheit (°F) and 350 °F. The first two options re-establish RCP seal cooling to prevent a loss-of-coolant accident through the seal. In response to SSA RAI 07 (December 16, 2016), the licensee stated:

Based on manufacturer testing, the elastomer components of the N-9000 [RCP] seals should not experience any significant failure for short periods of time (24 hours or less), even if RCS temperature remains high without seal cooling. Therefore, operator activities to cool down the plant to an RCS temperature

between 280 °F and 350 °F are not required to maintain safe and stable conditions.

The licensee further explained that the three RAs associated with maintaining seal cooling are considered defense-in-depth RAs. Based on the assumption that the seals would not fail under 24 hours, it is not clear if failures of the RCP N-9000 shutdown seals are modeled in the probabilistic risk assessments (PRAs).

- a. Specify whether or not the failure of the RCP shutdown seals was modeled in the fire and internal events PRAs, and identify the NRC-approved guidance that was used as the basis for that modeling.
- b. If the modeling was not based on NRC-approved guidance, describe and justify the modeling of the failure of the RCP shutdown seals in the fire and internal events PRAs. Alternatively, confirm that updated modeling using NRC-approved guidance will be included in the integrated analysis provided in response to PRA RAI 03 (see NRC letter dated October 18, 2016).

#### **SSA RAI 09.01**

NFPA 805, Section 4.2.4, requires that when the use of RAs results in the use of a performance-based approach, the additional risk presented by their use be evaluated.

In LAR Table B-3, the licensee indicates that fire compartment II-01 includes VFDR DB-1923, which is for the loss of automatic and timely control room trip capability of the main turbine. The disposition of this VFDR stated "it was determined that the risk, safety margin, and defense in depth meet the acceptance criteria of NFPA 805 Section 4.2.4 with a recovery action credited." However, in response to SSA RAI 09 (December 16, 2016), the licensee stated that the actions required for the VFDR in II-01 are taken in the main control room and, therefore, are not RAs.

Provide a corrected disposition for VFDR DB-1923 in fire area II-01, given that there is no RA to be credited.

#### **SSA RAI 10.01**

NFPA 805, Section 4.2.1, requires that one success path necessary to achieve and maintain the NSPC be maintained free of fire damage by a single fire. In LAR Attachment C, for all fire compartments, the licensee referenced VFDR DB-2012, which states:

Fire damage to installed makeup pumps could result in loss of ability to maintain RCS Inventory and Pressure. This could challenge the NSPC for Inventory and Pressure. This is a separation issue.

The LAR states that this VFDR will be corrected by plant modification ECP 13-0463, which installed additional RCS charging pumps, connections, and associated auxiliaries. The LAR further indicates that these modifications are associated with the development of diverse and flexible coping strategies (FLEX).

In response to SSA RAI 10.b (December 16, 2016), the licensee stated (emphasis added):

In every deterministic case, the function for make-up or for high pressure injection (HPI) remains available, and the NSPC are met without VFDR DB-2012. As a result, VFDR DB-2012 has been closed. Therefore, no recovery actions are credited to resolve this concern.

For the fire compartments where non-deterministic methods were used to evaluate separation for makeup or high-pressure injection, clarify if the FLEX RCS makeup pumps and RAs will be needed to meet the risk criteria, maintain defense-in-depth, and maintain safety margin.

#### **PRA RAI 02.01**

In response to PRA RAI 02.e.v (January 17, 2017), the licensee stated that the NRC's 2010 updated component unreliability dataset for permanently installed equipment will be used for the FLEX equipment failure rates as part of the integrated analysis to be provided in response to PRA RAI 03 (see NRC letter dated October 18, 2016). However, the performance of FLEX equipment may be different from permanently installed equipment with fixed power supplies and fixed suction and discharge lines which could result in higher failure rates than for permanently installed equipment.

- a. Justify the use of failure rates based on permanently installed equipment for each individual piece of FLEX equipment. Discuss the sensitivity of the risk results to the failure rates used for FLEX equipment. For example, provide the results of a sensitivity study that shows the impact on total risk and change-in-risk of using bounding failure rates for FLEX equipment and compare these values to the total risk and change-in-risk values when the failure rates for matching permanently installed equipment are used.
- b. Alternatively, provide and justify bounding failure rates for FLEX equipment, and confirm that these bounding failure rates will be used in the integrated analysis provided in response to PRA RAI 03 (see NRC letter dated October 18, 2016).

#### **PRA RAI 11.01**

In response to PRA RAI 11 (January 17, 2017), the licensee stated that main control room (MCR) abandonment scenarios due to loss of habitability were modeled for the post-transition plant using a simplified fault tree in combination with the fire scenario initiators that lead to these scenarios. The licensee stated in response to PRA RAI 11.a that "[t]he actions required for successful alternate shutdown are modeled as a single Human Failure Event (HFE) in the simplified fault tree." The response also indicates that the simplified fault tree accounts for fire-induced failures, but this is not described and the fault tree is not provided. Accordingly, it is not clear what events are included in the simplified fault tree model (besides the single HFE) and why a separated simplified model is adequate for this application. Given that differences in fire damage can lead to the need for different operator response actions, it is not clear how the RAs for alternate shutdown can be modeled as a single HFE.

- a. Describe the basic events that comprise the simplified fault tree for MCR abandonment scenarios due to loss of habitability. Justify that this model is adequate for determining the fire contribution from these scenarios. Describe the hardware failures included in the simplified fault tree, and justify any exclusion of cable or equipment failures that are

included in the detailed fire PRA model. Also, discuss how the impacts of fire damage are accounted for in the model.

- b. Justify how failure of operator actions required for alternate shutdown can be modeled as a single HFE for MCR abandonment scenarios due to loss of habitability, even though differences in fire impact may require different response actions.

#### **PRA RAI 12.01**

In response to PRA RAI 12 (January 17, 2017), the licensee indicated that MCR abandonment scenarios due to loss of control were modeled for the post-transition plant using the same simplified fault tree approach as described in its response to PRA RAI 11 (January 17, 2017). However, the licensee's response to PRA RAI 12 did not explain how the conditional core damage probability and conditional large early release probability were determined for MCR abandonment scenarios due to loss of control.

- a. Describe the basic events that comprise the simplified fault tree for MCR abandonment scenarios due to loss of control. Justify that this model is adequate for determining the fire contribution from these scenarios. Describe the hardware failures included in the simplified fault tree, and justify any exclusion of cable or equipment failures that are included in the detailed fire PRA model. Also, discuss how the impacts of fire damage are accounted for in the model.
- b. Justify how failure of operator actions required for alternate shutdown can be modeled as a single HFE for MCR abandonment scenarios due to loss of control, even though differences in fire impact may require different response actions.

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1 – REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST TO ADOPT NATIONAL FIRE PROTECTION ASSOCIATED STANDARD 805 (CAC NO. MF7190) DATED APRIL 19, 2017

**DISTRIBUTION:**

PUBLIC LPL3 r/f	JRobinson
RidsNrrDraAfpb Resource	RidsNrrPMDavisBesse Resource
RidsNrrDraApla Resource	THilsmeier
RidsACRS_MailCTR Resource	RidsRgn3MailCenter Resource
RidsNrrDraArcb Resource	DGarmon-Candelaria
RidsNrrDorLpl3 Resource	LFields
RidsNrrDssStsb Resource	JHyslop
RidsNrrLASRohrer Resource	

**ADAMS Accession No. ML17100A173**

**\*by email**

OFFICE	NRR/DORL/LPL3/PM	NRR/DORL/LPL3/LA	NRR/DRA/APLA
NAME	BPurnell	SRohrer	SRosenberg (HBarrett for)*
DATE	4/19/17	4/10/17	4/6/17
OFFICE	NRR/DRA/AFP/BC(A)	NRR/DORL/LPL3/BC	NRR/DORL/LPL3/PM
NAME	JRobinson*	DWrona*	BPurnell
DATE	4/5/17	4/5/17	4/19/17

**OFFICIAL RECORD COPY**