



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

June 3, 2015

Mr. George H. Gellrich, Vice President  
Exelon Generation Company, LLC  
Calvert Cliffs Nuclear Power Plant  
1650 Calvert Cliffs Parkway  
Lusby, MD 20657-4702

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2 -  
REQUEST FOR ADDITIONAL INFORMATION REGARDING THE NATIONAL  
FIRE PROTECTION ASSOCIATION STANDARD 805 LICENSE AMENDMENT  
REQUEST (TAC NOS. MF2993 AND MF2994)

Dear Mr. Gellrich:

By letter dated September 24, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML13301A673 and ML13301A674), as supplemented by letters dated February 9, 2015 (ADAMS Accession No. ML15043A249), and March 11, 2015 (ADAMS Accession No. ML15075A110), Exelon Generation, LLC, submitted a license amendment request that proposed to transition its fire protection licensing basis from Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.48(b) to 10 CFR 50.48(c), National Fire Protection Association Standard (NFPA) 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition, for Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2.

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing the submittal and has determined that additional information is needed to complete its review. The specific questions are found in the enclosed request for additional information (RAI). The NRC staff is requesting a response to the RAIs within 30 days of the date of this letter.

If you have any questions regarding this issue, please contact me at (301) 415-2549.

Sincerely,

A handwritten signature in black ink, appearing to read "Alex Chereskin", is positioned above the typed name.

Alexander N. Chereskin, Project Manager  
Plant Licensing Branch I-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosure:  
Request for Additional Information

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION  
REGARDING THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805  
LICENSE AMENDMENT REQUEST  
CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2  
CALVERT CLIFFS NUCLEAR POWER PLANT, LLC  
EXELON GENERATION COMPANY, LLC  
DOCKET NOS. 50-317 AND 50-318

By letter dated September 24, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML13301A673 and ML13301A674), Calvert Cliffs Nuclear Power Plant, LLC (the licensee), submitted a license amendment request (LAR) for Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 (Calvert Cliffs), to transition its fire protection licensing basis from Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.48(b) to 10 CFR 50.48(c), National Fire Protection Association Standard (NFPA) 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition. The licensee submitted request for additional information (RAI) responses by letters dated February 9, 2015 (ADAMS Accession No. ML15043A249), and March 11, 2015 (ADAMS Accession No. ML15075A110). Based on its review of the RAI responses, the U.S. Nuclear Regulatory Commission (NRC) staff requests the following additional information to complete its safety evaluation of the LAR:

Probabilistic Risk Assessment (PRA) RAI 02.b.i.01

The PRA RAI 02.b.i requested an explanation about how Human Reliability Analysis (HRA) methods for developing Human Error Probability (HEP) and joint HEP values are consistent with or conservatively bound NRC-accepted guidance in NUREG/CR-6850 or NUREG-1921. The response dated February 9, 2015, indicates that a small fraction of HEPs were found to have included a " $T_{\text{delay}}$  of zero that might not be appropriate." The response subsequently states that the overall impact on the Fire Probabilistic Risk Assessment (FPRA) results would likely be negligible because the number of affected HEPs is small compared to the total number of HEPs. The NRC staff has determined that this justification is insufficient. Even a very few HEPs in dominate sequences could have a large impact on risk results.

- a) Provide justification for the conclusion that the HEPs based on a " $T_{\text{delay}}$  of zero that might not be appropriate" have a negligible impact on the transition risk results (i.e., Core Damage Frequency (CDF), Large Early Release Frequency (LERF), delta ( $\Delta$ ) CDF and  $\Delta$ LERF) based on the collective contribution to risk and not on the fraction of HEPs affected.

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- b) Provide justification for the conclusion that the HEPs based on a " $T_{\text{delay}}$  of zero that might not be appropriate" have a negligible impact on the post-transition self-approval risk results (i.e., CDF, LERF,  $\Delta$ CDF and  $\Delta$ LERF) based on the collective contribution to risk and not on the fraction of HEPs affected.
- c) If it is not possible to demonstrate that the HEPs based on a " $T_{\text{delay}}$  of zero that might not be appropriate" have a negligible impact on both the transition and post-transition self-approval risk results, then provide updated risk results as part of the change-in-risk analysis requested in PRA RAI 03, using appropriate timing.

#### PRA RAI 02.b.ii.01

The response to PRA RAI 02.b.ii (in the letter dated February 9, 2015) requesting justification for each joint HEP less than  $10^{-5}$  states, in part, that 2,259 of the 2,700 joint HEP values are below  $10^{-5}$  and that, "[t]he documentation provided in the EPRI HRA Calculator justifies each unique HEP value, including the unique values used for all joint HEPs." The NRC staff disagrees that simply using the Electric Power Research Institute (EPRI) HRA Calculator tool is sufficient justification for any value. In NUREG-1792 the process for performing an HRA that is applicable to all methods is addressed (including the HRA Calculator) and concludes that joint HEP values are to not be below  $10^{-5}$  because "it is typically hard to defend that other dependent failure modes that are not usually treated...cannot occur." Consistent with "hard to defend," the NRC staff does not reject all values less than  $10^{-5}$  but does expect a robust investigation and documentation for each such value. Without agreeing or disagreeing with the discussion provided in the response for the two sample joint HEPs, the NRC staff finds that the written discussion that follows the lists of actions in each joint HEP to be the type of evaluation and justification required for each value less than  $10^{-5}$ . Confirm that a justification, such as these discussions, exist for each joint HEP less than  $10^{-5}$ , or if such discussions do not currently exist:

- a) Provide a justification for each HEP value less than  $10^{-5}$  that will be retained, confirm that a justification for each such HEP value has been developed, provide further examples of justifications developed, and provide the number of such HEP values that will be retained.
- b) For all other joint HEPs, apply a lower bound value of  $10^{-5}$  in the FPRA that will be used to support post-transition evaluations, and provide updated risk results as part of the aggregate change-in-risk analysis requested in PRA RAI 03.

#### PRA RAI 07.01

The response to PRA RAI 07 (in the letter dated March 11, 2015) appears to indicate that for a given Plant Area Unit (PAU), the fire ignition frequencies for self-ignited cable fires and cable fires due to welding and cutting are combined with the transient fire ignition frequency and then apportioned to transient scenarios within that PAU. It is unclear whether this approach is consistent with or bounds accepted methods given that: (1) potentially risk-significant cable trays that could serve as ignition sources for cable fire scenarios may be located outside of the zone of influence (ZOI) of postulated transient fire scenarios (e.g., cable trays located at a height greater than the vertical component of the transient ZOI, cable trays located near or

above permanent fixtures that occupy the available space such that the storage or placement of transient materials would be physically impossible, etc.); and (2) accepted methods used to apportion fire ignition frequency to individual transient fire scenarios (e.g., number of scenarios, floor area, etc.) would appear to be inconsistent with the accepted methods for apportioning fire ignition frequency to individual cable fire scenarios in Frequently Asked Question (FAQ) 13-0005 (ADAMS Accession No. ML13319B181) and NUREG/CR-6850 (i.e., cable loading, surface area, or volume, as applicable).

To resolve this issue, modify the FPRA's treatment of self-ignited cable fires and cable fires due to welding and cutting to be consistent with accepted methods (i.e., NUREG/CR-6850 and FAQ 13-0005), and provide updated risk results as part of the aggregate change-in-risk analysis requested in PRA RAI 03.

#### PRA RAI 08.01

The response to PRA RAI 08, dated March 11, 2015, appears to indicate that for a given PAU, the fire ignition frequency for junction boxes is combined with the transient fire ignition frequency and then apportioned to transient scenarios within that PAU. However, this approach, while proposed during the development of FAQ 13-0006 (ADAMS Accession No. ML13149A527), has been rejected by the NRC staff. It is unclear whether this approach is consistent with (or bounds) accepted methods given that: (1) potentially risk-significant junction boxes that could serve as ignition sources for junction box fire scenarios may be located outside of the ZOI of postulated transient fire scenarios (e.g., junction boxes located near or amongst permanent fixtures that occupy the available space such that the storage or placement of transient materials would be physically impossible); and (2) accepted methods used to apportion fire ignition frequency to individual transient fire scenarios (e.g., number of scenarios, floor area, etc.) would appear to be inconsistent with the accepted methods for apportioning fire ignition frequency to individual junction box fire scenarios in FAQ 13-0006 (ADAMS Accession No. ML13331B213) and NUREG/CR-6850 (e.g., number of junction boxes, number of cables entering junction boxes, etc.).

To resolve this issue, modify the FPRA's treatment of junction box fires to be consistent with accepted methods (i.e., NUREG/CR-6850 and FAQ 13-0006), and provide updated risk results as part of the aggregate change-in-risk analysis requested in PRA RAI 03.

#### PRA RAI 11.d.01

The response to PRA RAI 11.d, dated March 11, 2015, states that for well-sealed and robustly secured cabinets that house circuits of 440V or greater, propagation of fire outside the ignition source will be evaluated using the guidance in draft FAQ 14-0009 and the "NRC Position on Probability of Breaching Well-Sealed MCCs [Motor Control Centers] of 440V or Greater" (ADAMS Accession No. ML15023A064), dated January 23, 2015. However, the staff has determined that this guidance only applies to MCCs. Confirm whether fire propagation outside of well-sealed and robustly secured cabinets that are not MCCs, but do house circuits greater than 440V, is evaluated consistent with guidance in NUREG/CR-6850. If it is not, then provide updated risk results as part of the aggregate change-in-risk analysis as requested in PRA RAI

03. The updated risk results for evaluating propagation of these cabinets should be consistent with NRC-accepted guidance.

#### Fire Modeling (FM) RAI 05.01

Section 4.5.1.2 of the LAR states that fire modeling was performed as part of the FPRA development (NFPA 805, Section 4.2.4.2). Section 2.7.3.4 of NFPA 805 states, in part, that the personnel who use and apply engineering analysis and numerical models (e.g., fire modeling techniques) shall be competent in that field and experienced in the application of these methods.

In their responses to FM RAIs 05.a and 05.b, (ADAMS Accession Nos. ML15043A249 and ML15075A104), the licensee did not describe the qualifications of the fire modeling users in relation to the requirements of the standard (that is Section 2.7.3.4 of NFPA 805).

Describe how the qualifications of personnel performing fire modeling calculations met or will meet the requirements of NFPA 805, Section 2.7.3.4, during the development of the application, before transition, during the transition period, and after transition.

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

Section 3.3.4 of NFPA 805 requires that thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials be noncombustible or limited combustible. In LAR Attachment A, the licensee stated that it "Complies with Clarification" with Section 3.3.4 of NFPA 805. The NRC issued FPE RAI 01 to request additional information related to the compliance bases for Section 3.3.4. In the 90-day RAI response letter dated March 11, 2015, the licensee stated that thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials that are either permanently or temporarily installed in the plant are noncombustible or limited combustible with some exceptions. The licensee stated that the above materials, which cannot be classified as noncombustible or limited combustible, are treated the same as any other combustible materials located within the plant and are administratively controlled. The licensee further stated that these materials are tracked by the site combustible loading database and evaluated and approved by the site fire protection engineer. Site fire protection engineering ensures that the installed materials will not impact the ability of the plant to achieve and maintain the nuclear safety and radioactive release performance criteria.

Appendix B of Nuclear Energy Institute (NEI) 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," Revision 2, which is endorsed by the NRC in Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," states that "Complies with Clarification" are items that meet the requirements in NFPA 805 with clarification of an administrative or editorial nature (e.g., NFPA 805 specifies that a piece of information is documented in the pre-fire plans, but the licensee has it in the fire response procedure). Based on the above, the NRC staff does not agree that the licensee's current plant configuration meets the criteria for classifying "Complies with Clarification" to Section 3.3.4 of NFPA 805. Provide the following to address the subject compliance issue:

- a. Revise the compliance statement for Section 3.3.4 of NFPA 805 using one or more of the compliance strategies described in NEI 04-02 Appendix B, such as evaluating the condition in an existing engineering equivalency evaluation or submitting a performance-based evaluation approval request in accordance with 10 CFR 50.48(c)(2)(vii).
- b. Provide additional information characterizing the installed conditions that do not meet the NFPA 805, Section 3.3.4, requirement (i.e., types, quantity, permanent or temporary installation, locations, installation details, etc.).
- c. Describe the administrative controls and the criteria for evaluating the acceptability of future uses of materials that do not meet the requirements of NFPA 805, Section 3.3.4.

June 3, 2015

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/RA/

Alexander N. Chereskin, Project Manager  
Plant Licensing Branch I-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosure:  
Request for Additional Information

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