

## **NRR-PMDAPEm Resource**

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**From:** Feintuch, Karl  
**Sent:** Friday, October 26, 2012 5:30 PM  
**To:** Swenzinski, Laura; Alexander.Panagos@fpl.com  
**Cc:** Robinson, Jay  
**Subject:** ME6818, Additional RAIs for Duane Arnold Energy Center, LAR to Adopt NFPA 805  
**Attachments:** ME6818 DAEC AFPB APLA RAI Items (1) NFPA 805 LAR Round 2.docx

By letter dated August 5, 2011, Nextera Energy Duane Arnold, LLC, (the Licensee), submitted a license amendment request (LAR) to transition their fire protection licensing basis at the Duane Arnold Energy Center (DAEC), from Title 10 of the Code of Federal Regulations (CFR), Section 50.48(b), to 10CFR50.48(c), National Fire Protection Association Standard NFPA 805 (NFPA 805).

A review team, consisting of U.S. Nuclear Regulatory Commission (NRC) staff and contractors from Pacific Northwest National Laboratory (PNNL) and the Center for Nuclear Waste Regulatory Analyses (CNWRA) participated in a regulatory audit of the DAEC in Palo, Iowa from December 12-16, 2011. In a letter dated January 31, 2012, (ADAMs Accession No. ML12031A112) the NRC issued requests for additional information (RAIs). In letters dated April 23, 2012 (ADAMs Accession No. ML12117A052) and May 23, 2012 (ADAMs Accession No. ML12146A094) the licensee provided responses to the RAIs.

The Fire Protection (AFPB) and Probabilistic Risk Assessment Licensing (APLA) Branches have reviewed the information provided by the licensee and determined that additional information is needed to complete the review. Enclosed are the RAIs which have been approved by the applicable Branch Chiefs. Please note that review efforts on this task (TAC No. ME6818) are being continued and additional RAIs will be forthcoming.

The review branches are proposing a 60 calendar day response time from the date of formal issuance.

Please review the attached items for clarification and request a conference call if needed. Though identified as draft items subject to the need for clarification, they are firm relative to the information being requested.

If you have any questions or need any additional information concerning these RAIs, please contact Karl Feintuch at 301-415-3079.

Docket No: 50-331

Enclosure:  
As stated

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**From:** Feintuch, Karl  
**Created By:** Karl.Feintuch@nrc.gov

**Recipients:**  
"Robinson, Jay" <Jay.Robinson@nrc.gov>  
Tracking Status: None  
"Swenzinski, Laura" <Laura.Swenzinski@fpl.com>  
Tracking Status: None  
"Alexander.Panagos@fpl.com" <Alexander.Panagos@fpl.com>  
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(DRAFT) REQUEST FOR ADDITIONAL INFORMATION  
LICENSE AMENDMENT REQUEST TO ADOPT  
NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805  
PERFORMANCE-BASED STANDARD FOR FIRE PROTECTION FOR LIGHT WATER  
REACTOR GENERATING PLANTS  
DUANE ARNOLD ENERGY CENTER  
(TAC NO. ME6818)

from  
Office of Nuclear Reactor Regulation  
Division of Risk Assessment  
Fire Protection Branch  
PRA Licensing Branch

### **Safe Shutdown Analysis RAI 1.01**

In a letter dated May 23, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12146A094) the licensee responded to Safe Shutdown Analysis RAI 1. In that response regarding incipient detection (also called Very Early Warning Fire Detection Systems (VEWFDS)), for the main control room (MCR), the licensee indicated that because the design was not yet completed that the information was preliminary. Based on this response, the NRC staff requires additional information regarding this new detection system being installed.

Because the system is expected to have common air piping, the licensee stated that there would be separate means to diagnose the specific faulting or failing cabinet and that this diagnosis would be performed by the responders using local supplemental incipient detection equipment guided by operating procedures. There is insufficient information in the response to understand what sequence of alarm detection, panel identification, and plant response mitigation will be employed.

- a. Describe how will the response to control room fires change as a result of the installation of a VEWFDS.
- b. Describe how response times will be modified based on the design.
- c. Provide a detailed description of the proposed procedural response to a VEWFDS alert/alarm in a main control board section.

### **Safe Shutdown Analysis RAI 5.01**

In a letter dated April 23, 2012 (ADAMS Accession No. ML12117A052) the licensee responded to Safe Shutdown Analysis RAI 5 regarding the Updated Final Safety Analysis Report (UFSAR), and confirmed that the format and content will be consistent with frequently asked question (FAQ) 12-0062 (ADAMS Accession No. ML121430035). Section 7.4.2.1.1 of the UFSAR states: "The alternate shutdown capability system has been designed and installed to meet the requirements of 10 code of federal regulations (CFR) 50, Appendix R, Section III.G. The DAEC submitted the alternate shutdown capability system design to the NRC by Reference 1." Describe the changes planned for Section 7.4 of the UFSAR.

### **Fire Protection Engineering RAI 11**

The pump house wet pit is the primary source for fire water and is also the common source for the circulating service water system and general service water system. National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition, (NFPA 805), Sections 3.5.1, 3.5.2, and 3.5.16 contain provisions for fire water supply reliability and capacity, including requirements for common sources with other plant systems. For a fire in the turbine building that damages the flexible connectors at the circulating water piping connections to the main condenser, describe the operator actions and associated procedures that ensure the discharge of the circulating water through the failed connection does not result in loss of suction supply in the wet pit and subsequent failure of the fire pumps.

### **Fire Protection Engineering RAI 12**

In a letter dated April 23, 2012 (ADAMS Accession No. ML12117A052) the licensee responded to Fire Protection Engineering RAI 2, regarding the use of Electric Power Research Institute (EPRI) Technical Report (TR) 1006756, "Fire Protection Surveillance Optimization and Maintenance Guide for Fire Protection Systems and Features, and indicated that if the methodologies in EPRI TR 1006756 are implemented, surveillance frequencies of fire protection systems may be modified. However, adjusting the frequency of inspection, tests and maintenance activities required by NFPA 805, Section 3.2.3, using a performance-based approach such as EPRI Technical Report 1006756 constitutes the use of a "performance-based method permitted elsewhere in the standard." To implement performance-based changes using EPRI TR 1006756 (or other performance-based methods) to required inspection, tests and maintenance activities, submit a request for the change in accordance with 10 CFR 50.48(c)(2)(vii) and provide proper justification.

### **Fire Protection Engineering RAI 13**

In a letter dated May 23, 2012 (ADAMS Accession No. ML12146A094) the licensee responded to Safe Shutdown Analysis RAI 1 regarding incipient detection modification for the MCR, and indicated that because the design was not yet completed that the information was preliminary. Based on this response, the NRC staff requires additional information regarding this new detection system being installed.

- a. The response states, in Item d. that: "The system will be designed and installed in accordance with NFPA 72 and 76." Inspection, testing, and maintenance (IT&M) is necessary to ensure the system reliability and availability assumed in the fire probabilistic risk assessment (FPRA) are maintained. Provide additional detail on the system IT&M that is necessary to maintain the incipient detection system; and the associated PRA assumptions.
- b. The physical separation described in the response to Item b, stated, "...each panel had a substantial metal outer wall." During the audit, it was observed that some panels had "open backs". Clarify how the detection system design criteria is constrained or modified with regard to these "open back" panels.
- c. The Transition Report stated that "the design will be based on FAQ 08-0046 (ADAMS Accession No. ML093220426) and will meet the FAQ guidance such as: sensitivity, equipment voltage restrictions, and fast versus slow acting devices in regard to fire

growth.” However, the FAQ 08-0046 was not written for panels in the Control Room. Describe how the application of an incipient detection system will be integrated with the requirements of FAQ 08-0046.

#### **Fire Modeling RAI 02.01**

In a letter dated May 23, 2012 (ADAMS Accession No. ML12146A094) the licensee responded to Fire Modeling RAI 2.

- a. During the second audit, the licensee noted that the expected timeframe to complete data gathering and determine the impact on the PRA analysis is approximately the end of September, 2012. Notify the NRC staff in a letter when the remaining cables have been identified and analyzed and discuss the results.
- b. During the second audit, it was understood that the increased heat release rate (HRR) and fire propagation associated with thermoplastic cables did not result in the identification of any additional targets. Provide confirmation that this is correct.

#### **Fire Modeling RAI 04.01**

In a letter dated April 23, 2012 (ADAMS Accession No. ML12117A052) the licensee responded to Fire Modeling RAI 4. During the second audit, the staff discussed with the licensee the maximum panel dimension limit of applicability. It is understood that this maximum panel dimension can be exceeded up to a HRR of 783 kW without affecting the Generic Treatments assumptions.

Describe what would happen if an ignition source located along a wall or in a corner exceeds these dimensions, and therefore exceeds the maximum HRR for which the treatments are applicable. Explain how this upper limit of applicability is not exceeded for ignition sources located along a wall or in a corner.

#### **Fire Modeling RAI 05.01**

In a letter dated April 23, 2012 (ADAMS Accession No. ML12117A052) the licensee responded to Fire Modeling RAI 5.

- a. Clarification is required in the definition of “support role” and “technical lead”. Based on discussions during the second audit, the staff understood that there were more required internal qualifications than what was discussed in the response. Also, it is not clear how qualification for Peer Reviewers (NEI 07-12, Fire Probabilistic Risk Assessment Peer Review Process Guidelines, Nuclear Energy Institute, Rev. 0, November 2008) translates to qualification for users. Provide additional clarification regarding the above.
- b. Based on the discussions at the second audit, the staff understood there were more procedures in place than what was described in the response. Provide additional clarification regarding the above.
- c. Clarification is required to specifically identify any procedures used to integrate the process of communication between the PRA and fire modeling groups. Provide additional clarification regarding the above.

## **Fire Modeling RAI 07**

NFPA 805, Section 2.4.3.3, states: "The PSA [probabilistic safety assessment] approach, methods, and data shall be acceptable to the AHJ [authority having authority] ... " The NRC staff noted that fire modeling comprised the following:

- The Consolidated Fire Growth and Smoke Transport (CFAST) model was used to calculate abandonment times in the MCR.
- The Generic Fire Modeling Treatments approach was used to determine the zone of influence (ZOI) in all fire areas throughout the plant.

Section 4.5.1.2, "FPRA Quality" of the Transition Report states that fire modeling was performed as part of the FPRA development (NFPA 805 Section 4.2.4.2). Reference is made to Attachment J, "Fire Modeling V&V," for a discussion of the acceptability of the fire models that were used.

Specifically regarding the acceptability of CFAST for the control room abandonment time study, provide the CFAST files electronically for Bin 15 of each ignition source and each ventilation condition, including the sensitivity cases for wall/corner fires. During the second audit (May 30-31, 2012), it was understood this would include approximately 54 input files.

Specifically regarding the acceptability of the Generic Fire Modeling Treatments Approach:

- a. It was discussed at the second audit that when calculating the effect of secondary combustibles, the presence of two cable trays placed side by side at a height of 1-ft. above the principal ignition source is assumed to ignite after 5 minutes. The licensee stated that this is likely a conservative approach and a similar overall result will be determined using the FLASH-CAT method.

Provide additional supporting documentation to justify this statement. Verify that the configuration is not affected by any non-conservatism in this approach.

- b. Describe the treatment of the area within the 35 degree sector per NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities" but not included in the rectangular ZOI. Include any justifications for not using the method described in Section R.4.2 of NUREG/CR-6850.

## **Probabilistic Risk Assessment RAI 04.01**

Describe the methodology used for assigning localized transient and hot work ignition sources within a Physical Access Unit (PAU) in sufficient detail to summarize how all magnitude and frequencies were determined. To the extent not discussed in general methodology, provide a general discussion of the following points.

- a. NUREG/6850 provides that transient fires should at a minimum be placed in locations within the plant PAUs where conditional core damage probabilities (CCDPs) are highest for that PAU, i.e., at "pinch points." Pinch points include locations of redundant trains or the vicinity of other potentially risk-relevant equipment, including the cabling associated with each. Transient fires should be placed at all appropriate locations in a PAU where

they can threaten pinch points. Hot work should be assumed to occur in locations where hot work is a possibility, even if improbable (but not impossible), keeping in mind the same philosophy.

- b. In a letter dated April 23, 2012 (ADAMS Accession No. ML12117A052) the licensee responded to Probabilistic Risk Assessment RAI 4 stating that, "In the cases where a postulated transient included a larger target set and/or secondary combustibles (e.g., cable trays) a more appropriate area weighting factor was applied." Explain how this weighting factor was developed and identify what locations/PAUs involved these modified weighting factors and what the weighting factors were.
- c. If there are areas within a PAU where no transient or hot work fires are located since those areas are considered inaccessible, describe the criteria used to define "inaccessible." Note that an inaccessible area is not the same as a location where fire is simply unlikely, even if highly improbable.

### **Probabilistic Risk Assessment RAI 62**

In a letter dated April 23, 2012 (ADAMS Accession No. ML12117A052) the licensee responded to Fire Protection Engineering RAI 4 and clarified how sufficient safety margins were evaluated for the 10 CFR 50.48(c)(2)(vii) methods. The LAR does not describe how this evaluation was performed in the fire risk evaluations. Describe the methodology that was used to evaluate safety margins. The description should include what was evaluated, how the evaluations were performed, and what, if any, actions or changes to the plant or procedures were taken to maintain sufficient safety margins. Furthermore, Section 5.4.3 of the Fire Risk Evaluation Report describes the acceptance criteria for the safety margin evaluation to include: Fire Modeling and Plant System Performance. The guidance in NEI 04-02 Section 5.3.5.3 cites two added categories: PRA Logic Model and Miscellaneous. If this guidance was applicable to the safety margin evaluation provide support for excluding these two additional categories in the safety margin evaluation.

### **Probabilistic Risk Assessment RAI 63**

While the three echelons of defense-in-depth are discussed in LAR Attachment L and in a letter dated April 23, 2012 (ADAMS Accession No. ML12117A052) in response to Fire Protection Engineering RAI 7, neither describes the process in fire risk evaluations for ensuring that defense-in-depth is maintained. Describe the methodology that was used to evaluate defense-in-depth. The description should include what was evaluated, how the evaluations were performed, and what, if any, actions or changes to the plant or procedures were taken to maintain the philosophy of defense-in-depth. Include in the discussion the six acceptance criteria identified in Section 5.4.2 of the Fire Risk Evaluation report, which are taken from NEI 04-02 and NEI 00-01, as applicable.

### **Probabilistic Risk Assessment RAI 64**

Describe how core damage frequency (CDF) and large early release frequency (LERF) are estimated in main control room (MCR) abandonment scenarios. Do any fires outside of the MCR cause MCR abandonment because of loss of control and/or loss of control room habitability? Are "screening" values for post MCR abandonment used (e.g., CCDF of failure to successfully switch control to the Primary Control Station and achieve safe shutdown of 0.1) or have detailed human error analyses been completed for this activity. Justify any screening

value used. The justification should provide the results of the human failure event (HFE) quantification process described in Section 5 of NUREG-1921, including the following:

- a. The results of the feasibility assessment of the operator action(s) associated with the HFEs, specifically addressing each of the criteria discussed in Section 4.3 of NUREG-1921.
- b. The results of the process in Section 5.2.8 of NUREG-1921 for assigning scoping human error probabilities (HEPs) to actions associated with the use of alternate shutdown, specifically addressing the basis for the answers to each of the questions asked in the Figure 5-5 flowchart.
- c. The results of a detailed human reliability analysis (HRA) quantification, per Section 5.3 of NUREG-1921, if the screening CCDF is determined to not be bounding.