

NRR-PMDAPEm Resource

From: Galvin, Dennis
Sent: Thursday, May 14, 2015 2:22 PM
To: Scott Connelly (Scott.Connelly@duke-energy.com)
Cc: Richard Hightower (Richard.Hightower@duke-energy.com); Barillas, Martha; Miller, Barry
Subject: Request for Public Conference Call on Robinson NFPA-805 Fire Modeling
Attachments: Robinson Draft Third Round_FM.docx

Scott,

As Martha Barillas indicated separately, I am assisting her on several Robison licensing actions,

The staff has reviewed the Duke Energy response to FM RAI 01.b.01 in a letter dated April 1, 2015 (ADAMS Accession No. ML15099A454). The staff would like to schedule a technical discussion via a public teleconference of the response to better understand how Duke Energy has done and changed some of their fire modeling analyses. To support this discussion, the staff has formulated the issues in the form of 3 draft RAIs (attached) as a matter of convenience. Depending on the results of the discussion, the staff will determine the best means to move forward, which may mean producing actual draft RAIs.

A sensitive unclassified non-safeguards information (SUNSI) review was completed by the staff on the attached and the staff concluded that the attached does not contain SUNSI.

If you find any information that needs to be withheld from the public, please notify me within 5 days of receipt of this email.

I will follow-up with you to discuss arrangements for the public teleconference.

Thanks,

Dennis Galvin
Project Manager
NRC/NRR/DORL/LPL2-2
301-415-6256

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From: Galvin, Dennis

Created By: Dennis.Galvin@nrc.gov

Recipients:

"Richard Hightower (Richard.Hightower@duke-energy.com)" <Richard.Hightower@duke-energy.com>
Tracking Status: None
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"Miller, Barry" <Barry.Miller@nrc.gov>
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"Scott Connelly (Scott.Connelly@duke-energy.com)" <Scott.Connelly@duke-energy.com>
Tracking Status: None

Post Office:

| Files | Size | Date & Time |
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| MESSAGE | 1242 | 5/14/2015 2:21:00 PM |
| Robinson Draft Third Round_FM.docx | | 28218 |

Options

Priority: Standard
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Robinson Draft Third-Round Questions/RAIs – Fire Modeling

(these draft RAIs were formulated for the purpose of a public teleconference on Fire Modeling Analyses and may be deleted or significantly modified as a result of the teleconference)

Fire Modeling (FM) RAI 01.b.01.01

In a letter dated April 1, 2015 (ADAMS Accession No. ML15099A454), the licensee responded to FM RAI 01.b.01 and, for the first part of the RAI response, referred to Figure 9-2 of NUREG/CR-7010, “Cable Heat Release, Ignition, and Spread in Tray Installations During Fire (CHRISTIFIRE),” as an example to show that, as the progression of the fire extends outwards, “the burning region remains somewhat constant.” In the second part of its response, the licensee further stated that the vertical zone of influence (ZOI) was extended to the ceiling if there are multiple trays in the ZOI of the ignition source.

Figure 9.2 in NUREG/CR-7010 clearly shows that between the 15th and 30th minute periods, flames have spread laterally while no sections of the trays have burnt out. According to the FLASH-CAT model described in Chapter 9 of NUREG/CR-7010, lateral flame spread begins as soon as a tray ignites and propagates at a rate of 0.9 mm/s for thermoplastic cable. Cables do not burn out until the combustible jacket and insulation have been consumed. In addition, from the response to the second part of FM RAI 01.b.01, it does not appear that the licensee accounted for the effect of the increased heat release rate (HRR) due to fire propagation in cable trays on the horizontal ZOI or the development of a hot gas layer (HGL).

Re-evaluate the target damage for all scenarios that involve secondary combustibles (i.e., cable trays). In this re-evaluation, calculate fire propagation in stacks of cable trays taking horizontal flame spread into account, determine the expanded ZOI that corresponds to the combined HRR from the ignition source and the cable trays, and identify any targets that are in the expanded ZOI. If in the re-evaluation the licensee does not use the model described in Section R.4 of NUREG/CR-6850, “EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities,” or the FLASH-CAT model described in Chapter 9 of NUREG/CR-7010, explain in detail how the time to ignition of the lowest tray is determined and how subsequent fire propagation in cable trays is calculated. Determine the impact of the results of the re-evaluation on the risk (CDF, ΔCDF, LERF, and ΔLERF).

FM RAI01.b.01.02

In a letter dated April 1, 2015 (ADAMS Accession No. ML15099A454), the licensee responded to FM RAI 01.b.01, and referred to the Fire PRA Quantification documentation for details on how the licensee calculated the HRR of cable trays.

During its review of pertinent sections of the Fire PRA Quantification documentation, the NRC staff determined that the licensee made a change in the method to determine when HGL conditions are reached. Previously, HGL timing was determined based on the combined HRR of the ignition source and any secondary combustibles. The revised method is based on the total (cumulative) heat released. The Fire PRA Quantification documentation does not describe the new method in detail, but provides an example that seems to indicate that the change results in significant delays in the estimated time to HGL development.

Provide a detailed description of the revised methodology to determine the time to HGL conditions and provide technical justification for the underlying assumptions of the approach.

FM RAI 01.b.01.03

In a letter dated April 1, 2015 (ADAMS Accession No. ML15099A454), the licensee responded to FM RAI 01.b.01, and referred to the Fire PRA Quantification documentation for details on how the licensee calculated the time to ignition of the lowest tray in a stack of cable trays as well as the time at which HGL conditions are reached.

The response refers to section 5.6.2 of Fire PRA calculation RNP-F/PSA-0094 (Fire PRA Quantification), which in turn refers to another document for a description of the method that was used to determine the time to ignition of the lowest tray in a stack. This method relies on Heskestad's correlation to calculate the plume temperature at the tray as a function of time based on the HRR of a cabinet during the t^2 growth phase. However, the report also indicates that, in addition, a damage accrual method was used to determine the damage delay based on Tables H-5 and H-6 in NUREG/CR-6850, Appendix H. There is no detailed description of the method and it appears that the damage accrual method used does not account for the effect of the preheat that would occur during the initial period when the plume temperature is below the damage threshold. In addition, the licensee's response to FM RAI 01.a in a letter dated December 22, 2014 (ADAMS Accession No. ML15005A073), stated that all fire modeling tools and methods used in the development of the license amendment request (LAR) were discussed in LAR Attachment J, however, the use of a damage accrual method is not included.

Provide a detailed description of the damage accrual method used and the technical basis and verification & validation (V&V) to justify its use. In your description, discuss how the method accounts for the effect of the preheat that would occur during the initial period when the plume temperature is below the damage threshold. If the method does not address preheat, either revise the analysis to address this phenomenon, or provide justification that the method currently being used is sufficiently conservative.