July 22, 2010

MEMORANDUM TO: Mark Salley, Chief
Fire Research Branch
Division of Risk Analysis
Office of Nuclear Regulatory Research

FROM: Kendra L. Hill, Reliability and Risk Engineer ***/RA/***
Fire Research Branch
Division of Risk Analysis
Office of Nuclear Regulatory Research

SUBJECT: NOTICE OF NUCLEAR REGULATORY COMMISSION-OFFICE OF NUCLEAR REGULATORY RESEARCH/ELECTRIC POWER RESEARCH INSTITUTE (NRC-RES/EPRI) COURSE ON FIRE PROBABILISTIC RISK ASSESSMENT

DATE AND TIME: Session I:
Monday, September 27th through Friday, October 1st, 2010

DATE AND TIME: Session II:
Monday, October 25th through Friday, October 29th, 2010

LOCATION: Legacy Hotel and Conference Centre, 1775 Rockville Pike, Rockville, MD, 20852.

REGISTRATION: http://www.nrc.gov/public-involve/conference-symposia/epri-fire-pra-course/epri-fire-pra-course-info.html

CONTACT: Kendra L. Hill, RES/DRA
301-251-3300

PURPOSE: The U.S. Nuclear Regulatory Commission (NRC) Office of Nuclear Regulatory Research (RES), in cooperation with the Electric Power Research Institute (EPRI), will hold a joint course on fire probabilistic risk assessment (PRA). Since 2002, RES and EPRI, under a Memorandum of Understanding (MOU) on Cooperative Nuclear Safety Research, have been developing state-of-the-art methods for conducting a fire PRA. In September 2005, this work produced the "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," i.e., EPRI 1011989, NUREG/CR-6850[1]. Since 2005, RES and EPRI have jointly conducted six workshops on this methodology. Approximately 400 representatives

[1] NUREG/CR-6850, EPRI 1011989 may be downloaded from NRC's public website at the following address: http:///www.nrc.gov/reading-rm/doc-collections/nuregs/contract/ or obtained from EPRI website at www.epri.com

from the industry and government, within and outside the US, attended these workshops.

The 2010 Fire PRA Course/Seminar will be similar to the 2009 course which included in-depth technical presentations and hands-on sample problems intended for the users of this methodology.

New to the 2010 course is a separate Fire Human Reliability Analysis (HRA) module that will discuss the guidance provided in draft NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines."

As was done last year, this year's course will also include a day long session on fundamentals for each of the four technical areas. These fundamentals sessions will be conducted in parallel on the first day of the course and attendance in the fundamentals sessions is optional.

Additionally, the 2010 training has been expanded to relate the fire PRA portion of the ASME/ANS PRA Standard[2] to the methodology of NUREG/CR-6850 (EPRI 1011989) and also include discussion of the fire PRA issues resolved in the NFPA 805 Frequently Asked Question (FAQ) Program[3]. More recent developments since the publication of NUREG/CR-6850 (EPRI 1011989) related to circuit analysis and its role in fire PRA will also be included. The structure of the course is described below:

Module 0: Fundamentals – This module covers principal elements for each technical area covered in the Fire PRA Course, i.e., PRA, HRA, Electrical Analysis, and Fire Analysis. This introductory module will assist in preparing the student to understand the in-depth fire PRA training modules that follow. It is not intended to be a substitute for education and/or training in the subject matter. The sections under this module are designed for those students who are cross training, rather than for those participants that already possess the required knowledge for each in-depth module. For example, we recommend a Fire Protection Engineer (FPE) attend the section on principals of PRA prior to taking the PRA Module.

The following parallel sections will be offered on the 1st day:

Module 0a: Principles of PRA/HRA

Module 0b: Principles of Electrical Analysis

Module 0c: Principles of Fire Science and Modeling

Module 0d: Principles of HRA

[2] The ASME/ANS PRA Standard will not be provided for this course, Should students wish to access the Standard during the training, they are encouraged to bring their own copy.

[3] EPRI has published a joint publication with RES that is publicly available and consolidates the NFPA 805 FAQs related to fire PRA. This publication is designated as EPRI 1019259 / NUREG/CR-6850 Supplement 1. It may be downloaded for free from EPRI's website.

Module 1: PRA - This module covers the technical tasks for development of the both system and operator response to a fire. Specifically, this module covers NUREG/CR-6850, EPRI 1011989 Volume 2, Sections 2, 4, 5, 7, 14, and 15. This module is suited for PRA practitioners responsible for the systems modeling aspects of the fire PRA. Specifically, participants in this module should possess the following knowledge:

- A general knowledge of PRA as applied to nuclear power plants, including typical approaches, modeling techniques (event trees, fault trees, interfaces between PRA and HRA), and the quantification of PRA models
- Some familiarity with plant systems typically found in nuclear power plants. A simplified, but reasonably realistic example of a few plant systems will be used to demonstrate the methodology.
- Some familiarity with piping and instrumentation diagrams (P&IDs) and their use in developing PRAs

Module 2: Electrical Analysis - This module covers technical tasks for analysis of fire induced circuit failures in support of fire PRA analysis. Specifically, this module covers NUREG/CR-6850, EPRI 1011989 Volume 2, Sections 3, 9, and 10. The electrical analysis module is geared toward PRA practitioners and fire safe shutdown analysts with a practical understanding of the concepts and methods of fire-induced circuit failure analysis within the context of fire PRA or Appendix R post-fire safe shutdown circuit failure assessments. Specifically, participants in this module should possess the following knowledge:

- General circuit design and operational control for typical plant equipment
- Basic circuit analysis techniques for identifying and classifying fire-induced circuit failure modes
- Working level knowledge of typical electrical drawings, including one-line diagrams, schematic diagrams, electrical block diagrams, wiring/connection diagrams, raceway layout drawings, instrument loop diagrams, etc.
- Cable and raceway, Appendix R post-fire safe shutdown, and fire PRA database structures and software
- Appendix R post-fire safe shutdown circuit analysis
- Progression of events stemming from the EPRI/NRC cable fire testing to characterize fire induced circuit failures (historical perspective)

- Emerging issues and challenges associated with the analysis of multiple spurious operations

Module 3: Fire Analysis - This module covers technical tasks involving plant partitioning, fire frequency analysis, and the development and analysis of fire scenarios from fire ignition to target impact and fire suppression. Specifically, this module covers NUREG/CR-6850, EPRI 1011989 Volume 2, Sections 1, 6, 8, and 11. This module is suited for PRA practitioners responsible for treating those aspects of the fire PRA specifically related to the fire growth and damage assessment tasks. Specifically, participants in this module should possess the following knowledge:

- A general understanding of the fire frequency calculation process as practiced in fire PRA,
- Knowledge of general fire protection features and systems as typically implemented at a NPP,
- A general understanding of how fire models are used in support of the fire PRA (a proficient level of fire modeling expertise is *not* required),
- A general understanding of fire behavior and the parameters most important to a fire growth and damage analysis (e.g., concepts such as fire spread, heat release rate (HRR), target response, and fire suppression and detection analyses).

Module 4: HRA - This module covers technical tasks related to modeling human failure events (i.e., the failure of operator responses) in a fire context. This module will focus on the guidance provided in draft NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines" which largely replaces the human reliability analysis (HRA) guidance provided in EPRI 1011989, NUREG/CR-6850, Volume 2, Section 12 This module is suited for HRA/PRA practitioners responsible for the HRA aspects of the fire PRA. Specifically, participants in this module should posses the following knowledge:

- A general knowledge of PRA as applied to nuclear power plants, including typical approaches, modeling techniques (event trees, fault trees, interfaces between PRA and HRA), and the quantification of PRA models
- Some familiarity with plant systems typically found in nuclear power plants. Simplified, but reasonably realistic examples of plant systems that may be represented in PRAs and manipulated by operators will be used to demonstrate the methodology.

- Some familiarity with plant operations and operating procedures. Examples of HRA tasks, such as human failure event identification, will use typical operator actions and simplified examples of operating procedures to demonstrate the methodology.
- A general understanding of the typical influences on operator performance and how they are represented in HRA tasks such as human failure event definition and quantification.

The course will be held in two sessions:

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Monday, September 27th through Friday, October 1st, 2010

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Monday, October 25th through Friday, October 29th, 2010

Location: The Legacy Hotel and Conference Centre, 1775 Rockville Pike, Rockville, MD, 20852

Participants can attend only one module per session. Each module is offered once during each session, and that module lasts the full session. When registering, specify your priority module and session date, as space may be limited. Requests for priority on a particular module and session will be accommodated to the extent possible.

Please note: While laptop computers are not required for participation in this course, participants may wish to bring a laptop to follow along with the course materials electronically. Printed notebooks will NOT be provided this year as they were in previous years. Slides and other required class material will be uploaded to the NRC website approximately 2 weeks prior to the training. It will be the participants' responsibility to download the material. They can either print a hard copy or follow along on their laptops.

It is recommended that participants read appropriate sections of NUREG/CR-6850 (EPRI 1011989) corresponding to the selected training module prior to the course. This report may be downloaded from NRC's public website at the following address: http://www.nrc.gov/reading-rm/doc-collections/nuregs/contract/cr6850/ or obtained from EPRI website at www.epri.com.

Those interested in attending this workshop should log on to http://www.nrc.gov/public-involve/conference-symposia/epri-fire-pra-course/epri-fire-pra-course-info.html to register. Registration for this workshop is required to ensure space availability. If you have any questions, you may contact Ms. Hill at 301-251-3300.

PARTICIPANTS:

NRC/Contractor	EPRI/Contractor
J.S. Hyslop	R. Kassawara
S. Nowlen	B. Najafi
M. Kazarians	F. Joglar
J. LaChance	D. Funk
F. Wyant	R. Anoba
S. Cooper	J. Julius
J. Forrester	S. Lewis

CATEGORY: This meeting is a Category 3 meeting*. The public is invited to participate in this meeting by providing comments and asking questions throughout the meeting. Please note this workshop is being conducted in a classroom format; registration is required to ensure space availability.

The NRC provides reasonable accommodation to individuals with disabilities where appropriate. If you need a reasonable accommodation to participate in this workshop, or need the workshop notice or agenda in another format (e.g., Braille, large print), please notify the NRC's meeting contact. Determinations on requests for reasonable accommodation will be made on a case-by-case basis.

*Meetings between the NRC technical staff and external stakeholders are open for interested members of the public, petitioners, interveners, or other parties to attend as observers pursuant to Commission policy statement, "Enhancing Public Participation in NRC Meetings," 67 *Federal Register* 36920, May 28, 2002.

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