

ADDENDUM  
to  
MEMORANDUM OF UNDERSTANDING  
between  
U.S. NUCLEAR REGULATORY COMMISSION  
and  
ELECTRIC POWER RESEARCH INSTITUTE, INC.  
on  
COOPERATIVE NUCLEAR SAFETY RESEARCH

**FIRE RISK (Revision 4)**

I. Introduction

This Addendum to Memorandum of Understanding (the Addendum) is entered into by and between the U.S. Nuclear Regulatory Commission (NRC) and the Electric Power Research Institute, Inc. (EPRI) effective as of the date of signature of the last of the parties to execute this Addendum (the Effective Date). NRC and EPRI are parties to that Memorandum of Understanding on Cooperative Nuclear Safety Research (the MOU, found under Enclosure 1). Pursuant to the MOU, the parties agreed to encourage cooperation in nuclear safety research, which provides benefits for the NRC, the nuclear power industry (the "Industry"), and the public.

This Addendum describes a cooperative research and development program in the area of nuclear power plant (NPP) fire probabilistic risk assessment (FPRA) research and development (R&D) between EPRI and the NRC's Office of Nuclear Regulatory Research (NRC-RES). This addendum replaces the previously signed addenda on Fire Risk dated October 30, 1998, Rev. 1 dated May 18, 2001, Rev. 2 dated January 14, 2009, and Rev. 3 dated July 7, 2010, between NRC-RES and EPRI.

The NRC-RES and EPRI are currently supporting a number of research efforts aimed at enhancing the state-of-the-art knowledge of the contributors to fire risk and improving current FPRA methods, tools and applications. NRC and EPRI have previously collaborated on activities to improve the technology for assessing the risk from circuit failure issues, guidance for using fire models, and fire PRA methodologies. EPRI FPRA activities include work in the areas of fire events data collection and evaluation, fire modeling (including code comparisons), improved FPRA techniques and applications, and performance-based fire protection methods development.

II. Goals & Objectives

The overall objective of the ongoing NRC-RES and EPRI fire R&D programs is the improvement of FPRA methods, tools, data, and technical information useful to the regulator and industry.

More specific objectives of this cooperative program include the following:

1. To ensure the timely exchange of information (e.g., objectives, milestones) on planned and ongoing research activities to foster collaboration and prevent duplicate activities;
2. To ensure the sharing of technical data needed by the NRC-RES and EPRI R&D programs;
3. To ensure the timely sharing of R&D results and tools;
4. To build and refine FPRA data needed to support risk-informed applications;
5. To improve capabilities of current and advanced FPRA methods and tools; and
6. To actively collaborate on mutually beneficial experimental projects.

### III. Scope and Plan

This program includes a wide variety of potential collaborative activities (including information exchange meetings, support for expert panels, jointly-sponsored projects and experiments) aimed at achieving the preceding objectives.

The program elements are as follows.

1. Programmatic information exchange. Both parties will exchange information concerning the objectives, milestones, and planned approaches for their ongoing FPRA R&D tasks. This activity has been taking place since 1998.
2. Technical information exchange. Both parties will facilitate the exchange of technical information needed to satisfactorily complete each party's FPRA R&D tasks. This includes the support of an annual fire risk research program review meeting. It also includes support of working meetings among researchers (on an agreed-upon as-needed basis), responding to data requests, and the timely exchange of research results and information relating to FPRA tools.
3. Cooperative research projects. In some cases, it may be most efficient for NRC-RES and EPRI to cooperate in performing certain research tasks or projects. These projects will be identified by mutual agreement of both organizations. Areas in which coordinated or cooperative research activities may be undertaken include those summarized below. In each case, and especially with regard to research identified as potentially subject to joint activities, the decision regarding the extent of collaboration will be based upon mutual agreement.

#### A. Fire Probabilistic Risk Assessment (FPRA)

EPRI and NRC-RES will continue to participate in joint activities to provide improved guidance on conducting FPRAs using the methods, tools, and data developed under the NRC Fire Risk Research Program, EPRI Fire Technology Program, joint research conducted as part of other projects under this Addendum, as well as other pertinent research programs within the two organizations. Collaboration includes projects such as an update to EPRI 1011989 and NUREG/CR-6850, "Fire PRA Methodology for Nuclear Power Facilities," and documentation of lessons learned and insights from the application of fire PRA methodologies, including examination and updating of PRA methods based on applicable operational data.

## B. Fire Modeling

The NRC-RES and EPRI will continue to participate in a number of joint activities intended to develop guidance for NPP fire protection and risk assessment engineers in the use of fire modeling, particularly in performance-based/risk-informed applications.

## C. Human Reliability Analysis (HRA)

NRC-RES and EPRI will continue to work jointly to build upon the HRA guidance provided in NUREG-1921/EPRI1023001 "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines." This work will continued to refine the methodology and guidance for performing detailed HRA for the human actions credited in a fire PRA for achieving safe shutdown under a variety of post-fire conditions including fire events that require abandoning the main control room.

## D. Post-Fire Circuit and Cable Behavior

The NRC-RES and EPRI will continue to participate in a number of joint activities intended to evaluate and develop guidance for post-fire circuit and electrical cable behavior.

## E. Seminars/Workshops

Subject to continuing stakeholder needs and interest, NRC-RES and EPRI will collaborate to conduct seminars and workshops relating to FPRA conducted using the methods and guidance in NUREG/CR-6850 (EPRI 1011989) and subsequent advancements jointly developed, including post-fire human reliability analysis (NUREG-1921/EPRI 1023001) and fire modeling (NUREG-1934/EPRI 1023259).

## F. Testing

Technical collaboration on testing will be pursued for projects that are producing data to improve the knowledge for the application of FPRA where collaboration will enhance the extent to which results are useful to elements of FPRA, including fire modeling.

## G. Data Collection Sharing

There are numerous databases available to EPRI that would improve the understanding and quantification of FPRA. NRC-RES and EPRI will collaborate on data collection and analysis projects as appropriate.

All EPRI data and materials subject to commercial or other use restrictions will be submitted to the NRC under a general affidavit addressing all documents, data and materials to be shared with the NRC pursuant to this Addendum and requesting that such documents, data and materials be withheld from disclosure to the public pursuant to 10 C.F.R. §2.390 as provided in the MOU. Should the NRC reject EPRI's request to withhold the EPRI data or materials from public disclosure, the project will not proceed.

IV. Period of Performance

The initial period of performance will be from the Effective Date through September 30, 2021, to be extended or revised in writing if mutually agreeable to EPRI and NRC.

V. Project Direction and Coordination:

All technical interactions will be managed through a single designated point of contact for each party (the "Project Contacts"). Technical meetings to coordinate this effort and to discuss project progress will be arranged through the respective Project Contacts. The Project Contacts are:

<p>NRC: Mark Henry Salley Chief, Fire and External Hazards Analysis Branch Office of Nuclear Regulatory Research Mail Stop T10-A12 Washington, DC 20555-0001 301-415-2474 MarkHenry.Salley@nrc.gov</p>	<p>EPRI: Stuart Lewis Senior Program Manager, Risk and Safety Management Electric Power Research Institute 942 Corridor Park Blvd. Knoxville, TN 37932 865-218-8054 slewis@epri.com</p>
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VI. Cost and Schedule

EPRI and the NRC are responsible for their respective costs in implementing this Addendum. The costs of this cooperative program (above and beyond the costs of the existing FPRA R&D programs of both parties) are associated with the support of a) annual FPRA cooperative R&D program review meetings, b) working meetings between researchers, c) responses to data requests, and d) the activities identified under Item III.3 above. Additional costs may be incurred if other parties (especially international parties) are added to the program.

VII. Dispute

If a dispute arises out of or relating to this Addendum or any breach thereof, the parties will first attempt to settle the dispute through direct negotiation between the Project Contacts. If such a dispute cannot be settled by the Project Contacts, the dispute shall be submitted to the Senior Management Contacts (as defined in the MOU) for resolution.

AGREEMENT

/RA/ 9/28/16  
Michael F. Weber Date  
Director of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission

/RA/ 9/30/16  
Neil Wilmshurst Date  
Vice President and Chief Nuclear Officer  
Electric Power Research Institute