U.S.NRC
United States Nuclear Regulatory Commission
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RIC 2012

Office of Nuclear Regulatory Research

Fire Research: Learning from the Past, Preparing for the Future

Fire Testing

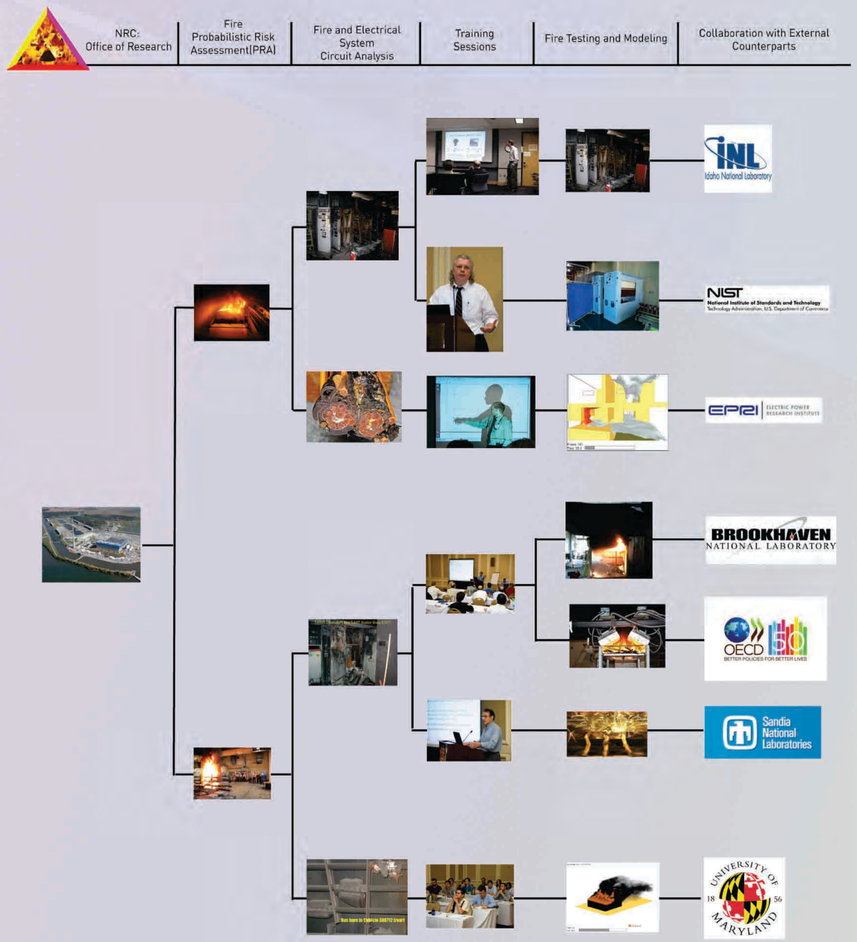
- **Cable Heat Release, Ignition, and Spread in Tray Installations during Fires (CHRISTI-FIRE II)**
  - The Office of Nuclear Regulatory Research (RES) of the U.S. Nuclear Regulatory Commission (NRC) in collaboration with the National Institute of Standards and Technology (NIST), is researching electrical cable fire phenomena to better understand how to predict cable tray ignition, fire propagation (flame spread), and heat release rate. Researchers will use this quantitative information to develop more realistic models of cable fires for use in probabilistic risk assessments (PRAs). Phase I is complete (NUREG/CR–7010, "Cable Heat Release, Ignition, and Spread in Tray Installations During Fire (CHRISTIFIRE), Volume 1: Horizontal Trays"). Phase II testing is currently under way (final report expected in fall 2012).
- **Proposed International Program on High-Energy Arcing Faults Fire Experiments**
  - NRC/RES is proposing an international research program to study the impacts of catastrophic electrical failure, referred to as high-energy arcing faults (HEAF). These events have occurred in the electrical switching components of nuclear power plants (NPP's) around the world. The NRC has proposed this research topic to the international community, and many Asian and European countries have expressed interest in collaborative research by donating equipment, offering technical expertise and contributing funding. The NRC will be working through the International Program Team of the RES Proactive Materials Degradation Assessment program and the Organization for Economic Co-operation and Development (OECD) to develop this program in 2012.

Training Sessions

- **Methods for Applying Risk Analysis to Fire Scenarios (MARIA-FIRES)**
  - NRC/RES and the Electric Power Research Institute (EPRI) designed the 2008 Fire PRA Workshop proceedings as a self-study training course on fire PRA. Since the initial report was issued, two sections have been added to the course: Fire Human Reliability Analysis (HRA) and Fire Modeling. The NRC/RES will be updating the course material to include fire HRA training presentations, videos, examples, and solutions (final report expected in fall 2012).
- **Public Fire PRA Workshop 2012**
  - NRC/RES and EPRI will join together to provide free training workshops on fire PRA, electrical circuit analysis, human risk analysis, and fire modeling techniques used to evaluate fire risk scenario analysis in nuclear power plants. Two annual training sessions are being planned for the summer and winter 2012 in the Washington, DC metro area.

Fire Probabilistic Risk Assessment and Human Reliability Analysis

- **Updated Fire Events Database**
  - NRC/RES, in collaboration with EPRI, is updating the fire events database developed by EPRI and used in NUREGG–6850, "Fire PRA Methodology for Nuclear Power Facilities" (EPRI TR-1011989). The updated information will improve upon previous data collection efforts and provide the NRC and industry with updated fire frequencies to use in state-of-the-art PRA analysis (final report expected in fall 2012).
- **EPRI-NRC/RES Fire Human Reliability Analysis Guideline (NUREG–1921, EPRI 1023001)**
  - NRC/RES, in collaboration with EPRI, is planning to issue this completed joint report in summer 2012. A session on fire HRA has been added to the annual Fire PRA training sessions.



Fire Modeling

- **Nuclear Power Plant Fire Modeling Application Guide (NPP FIRE MAG) (NUREG–1934/EPRI–1023259)**
  - NRC/RES, in collaboration with EPRI, is developing a fire modeling application guide to further the science of fire modeling in NPP applications. The guide assists users of fire models using realistic NPP fire scenarios (final report expected in summer 2012).

Fire and Electrical Systems Circuit Analysis

- **Kerite Cable Fire Testing**
  - NRC/RES conducted a confirmatory research testing project to determine the thermal fragility of the unique Kerite cable. The results were published in NUREG/CR–7102, "Kerite Analysis in Thermal Environment of Fire (KATE-Fire)" (final report issued December 2011).
- **Direct Current Circuit Fire Testing—Direct Current Electrical Shorting in Response to Exposure Fire (DESIREE-FIRE)**
  - NRC/RES conducted a testing program to collect data on the failure modes of risk-significant, direct-current-powered control circuits. NUREG/CR–7100, "Direct Current Electrical Shorting in Response to Exposure Fire (DESIREE-FIRE) (test results expected to be issued in spring 2012).
- **Electrical Circuit Phenomena Identification and Ranking Table (PIRT) and Expert Elicitation**
  - The NRC and EPRI are sponsoring a panel of experts to identify the importance of various fire-induced circuit damage phenomena and their effects on the likelihood of circuit failure. The panel will also provide input on future electrical circuit research needs (final report expected in winter 2012).

Collaboration with External Counterparts

- **The Fire Research Branch is pleased to work with collaborative partners, including EPRI, NIST, Sandia National Laboratories, Brookhaven National Laboratories, Idaho National Laboratories, The University of Maryland, and the OECD.**

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