Improving Fire Probabilistic Risk Assessment
Realism through Regulatory Collaboration

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Probabilistic risk assessments (PRAs) are living documents:

Section 3.2 of NUREG/CR-6850, “EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities,” issued September 2005:

“The methods documented in this report represent the current state of the art in Fire PRA. Fire PRA is an evolving discipline. The most effective way to allow these methods to further evolve is through their use in practical applications.”

Section 1-5.3 of American Society of Mechanical Engineers/American Nuclear Society RA-Sa-2009, “Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications”:

“The program should include monitoring of changes to the PRA technology and industry experience that could change the results of the PRA model.”
The living nature of fire PRAs is echoed in guidance:


The PRA model may change as a result of improved methods or techniques; operating data may change the availability or reliability of the plant’s structures, systems, and components; or the plant design or operation may change. Therefore, to ensure that the PRA represents the risk of the current as-built and as-operated plant, the PRA needs to be maintained and upgraded over time.

Appendix C to Nuclear Energy Institute 07-12, “Fire Probabilistic Risk Assessment (FPRA) Peer Review Process Guidelines,” Revision 1, issued June 2010:

Recommends that the update frequency should be no greater than once per year and no less than once every 3 years (or every other fuel cycle).
Recent Improvements

- Frequently Asked Questions (FAQ) Process
  - FAQ 10-0059, “NFPA 805 Monitoring”
  - FAQ 14-0007, “Transient Fire Frequency Likelihood”
  - FAQ 16-0011, “Cable Tray Ignition”

- NUREGs
Ongoing or Emerging Improvements

• HEAF testing to better understand frequency, zone of influence, etc.
• Fire modeling guidance for electrical cabinets, electric motors, indoor dry transformers, and the main control board
• Better characterization of fire growth modeling and nonsuppression probabilities
• Better characterization of transient fires
Concluding Thoughts

• The Office of Nuclear Reactor Regulation (NRR) has worked closely with the Office of Nuclear Regulatory Research and industry to improve the state of knowledge for fire PRA.
• Many licensees have considered or performed maintenance on or upgrades to their fire PRAs.
• Many improvements were made during licensee transitions to National Fire Protection Association 805, “Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants,” as a result of the licensing review process, which included requests for information.
• Some methods have evolved or emerged, many of which NRR has formally accepted or endorsed.
• NRR continues to consider new methods and processes for improving realism in fire PRA.
• Future risk-informed licensing actions will benefit from ongoing improvements.
Questions?