Implications of Fire PRA Conservatism and Potential Improvements to Realism

NRC Public Meeting

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Problem Statement

- There are inherent uncertainties and conservatisms in all Fire PRAs and the results derived for overall CDF/LERF and for applications of the Fire PRA.
  - This is not a criticism of existing methods, simply recognizing the reality of how Fire PRA is performed. Some of these issues cannot be easily addressed, and we may never find adequate resolution.
- These inherent uncertainties and conservatisms need to be considered as we communicate on regulatory evaluations and operational decisions made.

Examples of Uncertainties and Conservatisms

- Beneficial Failures - Fire PRAs must consider only the worst case failures in all cable impacts. Reality is there is some likelihood of each combination of failures when a cable tray is impacted.
- Degree of impact on Cable Trays – When a cable tray is in a zone of influence it is assumed that EVERY cable is impacted.
- Amount of Detail in Fire Modeling
  - Some sites exclude some balance of plant systems due to excessive cost to get the cable information and perceived low significance
  - Fire PRA Teams must make decisions based on getting acceptable results with available resources.
    - Some areas are very complex to evaluate.
    - Often conservative assumptions and methods are used due to resource and schedule requirements. If “acceptable” results (RG 1.174 criteria) achieved then no further detail applied.

Impact of Uncertainties & Conservatisms

- Why are these uncertainties and conservatisms important?
  - Fire PRAs are a large part of applications for 4B Risk Informed Completion Times and 50.69 Risk Informed Categorization and NFPA-805
    - NFPA-805 criteria for configuration changes are VERY small (1E-07 CDF/1E-08 LERF)
  - The NRC's expectation that Fire PRA results be used directly into the Significance Determination Process findings.
  - The sites are considering the use of the Fire PRA for operational decisions (on-line risk assessment for example) and masking of systems may occur due to dominance of fire risk numbers

Fire PRA Realism Improvement - Overview

- Substantial improvements to Fire PRA realism have been made
  - Additional work remains
  - Critical to prioritize any future research
- Industry conducted thorough review of sources of conservatism in Fire PRA
  - Quantitative impact
  - Number of plants affected
  - Work needed to support
- Determined high priority items to work in near term
  - Suggested resolution approach (FPRA FAQ, EPRI Report/NUREG, Vetting Panel Review)

Proposed for Resolution Via Near-Term Reports

- Transient fire HRR and methodology
- Incipient detection
- Fire growth profiles for different types of ignition sources
- Obstructed plume zone of influence
- Cable coatings
- Control room abandonment
- In-cabinet fire growth modeling
- HEAF suppression curve
- Electric pump and motor HRR

Proposed for Resolution via Fire PRA FAQ

- Cabinet to cabinet fire propagation
- Plant trip assumption
- “Freeze point” for fire ignition frequency
- Ignition criteria for cable trays

Methods Ready for Vetting Panel

- Liquid/oil spills
- Wall and corner effects
- Transient fires propagation parameter

Above methods all documented in EPRI report issued November 2015

Conclusions

- Existing data and operating experience support development of new methods identified as high priority
  - No new testing needed
- Substantial improvements can be made in the near term, with industry and NRC support