



**Experiences in Implementing Performance-Based Fire Protection (NFPA 805)**

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**Topics**

- Current Implementation Status of Duke Energy in Performance-Based Fire Protection (NFPA 805)
- NFPA 805 Impact on Plant Culture
- Concerns with Implementing NFPA 805
- Observations on NRC use of NFPA 805
- Going Forward



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**Current Implementation Status of Duke Energy in Performance-Based Fire Protection (NFPA 805)**

- All six Duke Energy nuclear sites have submitted NFPA 805 LARs
- Three nuclear sites have received their NRC NFPA 805 Safety Evaluation and have implemented NFPA 805
- The other three sites are in various stages of NRC SE development
- To date, Duke Energy has completed three NRC Fire Protection Triennials under NFPA 805
- Using NRC endorsed methods in each station's Fire PRA resulted in fire being the largest overall contributor to core damage frequency



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## NFPA 805 Impact on Plant Culture

- Increase in management oversight
  - Fire Protection Oversight committees at each site chaired by Operations
- Behavior changes in managing fire risk
  - Transient combustible control, amount and locations
  - Electrical cabinet doors control
  - Fire suppression and fire detection systems availability
- Engineering change process
  - Many modifications have a Fire PRA aspect that needs evaluation
  - Design Engineering is in a learning mode on Fire PRA impact



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## NFPA 805 Impact on Plant Culture

### Before NFPA 805 (typical)

#### Operations

Fire Brigade response  
Routine fire protection system operation

#### Design Engineering

Modification review for fire limited to Appendix R and Systems Structures Components (SSC), all Fire

#### PRA Staff

Limited review interface with Appendix R

#### Fire Program Staff

Maintenance of safe shutdown analysis  
Cable routing database maintenance  
Limited circuit analysis

### NFPA 805 (typical)

#### Operations

Fire Brigade response  
Routine fire protection system operation  
Response to incipient detection fire and trouble alarms  
Transient combustible walk downs  
Understanding of important fire areas

#### Design Engineering

Modification review for fire impact consists of NSCA SSC, NFPA 805 impact oil sources, new cables, fire sources and PRA components

Increased PRA interface on proposed modifications and understanding fire impact

#### PRA Staff

Significant PRA interaction for modifications and fire protection changes

#### Fire Program Staff

Maintenance of safe shutdown analysis  
Cable routing database maintenance  
Fire modeling/ Circuit analysis  
Screening of plant modifications for Fire PRA impact



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## Concerns with Implementing NFPA 805

- Current approaches overestimates Fire CDF
  - Improvements in NRC endorsed PRA methods is taking time
  - Overstated fire risk could be masking other significant plant risk
- Maintaining Fire PRAs current is considerably more challenging than originally envisioned
  - PRA model level of detail is much higher
    - 1000 to 2000 initiating events
    - Databases are large and complex
  - Special skills and knowledge required
    - Continual need for these skills rather than a one-time task as originally believed
    - Some reliance on contractors continues
  - PRA and Fire Protection organization work load is much greater than expected



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### Observations on NRC use of NFPA 805

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- NRC inspections of NFPA 805 uses a deterministic approach in a evaluating the performance based program
  - Inspectors want to know what is impact of all cables in each fire zone of influence (bookkeeping exercise)
  - Any new target (e.g. cable) in a risk significant scenario not previously analyzed is a violation, no matter how small the impact on the Fire PRA
  - Suggest focus on impact of issue on the Fire Protection Program decision making as it is risk informed not risk based program
- NRC staff has been at times reluctant to use results from the Fire PRA for NRC Significant Determination Process



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### Going Forward

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- Understanding of what is a change in the fire protection program
- Maintaining knowledge and skills to maintain the analysis
- Reducing the effort of maintaining the Fire PRA and NPFA 805
- Support NRC/EPRI efforts to speedup Fire PRA methods that improve Fire PRA realism
- Support efforts to use performance based methods for NRC Inspections
- Support use of RG 1.200 Fire PRA for Significant Determination Process evaluations
- Investigate using NPFA approach for resolving Chapter 3 issues



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Questions?



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