

Risk-Informed/Performance-Based Fire Protection for Nuclear Power Plants

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INTRODUCTION^a

The U.S. Nuclear Regulatory Commission (NRC) revised the fire protection requirements for commercial nuclear power plants to allow them to voluntarily change their fire protection licensing basis, permitting their use of risk-informed/performance-based evaluations for program changes without NRC pre-approval [Refs. 1-2]. The existing deterministic fire protection requirements [Ref. 3] established engineering margin through post-fire survival of safety systems capable of safe reactor shutdown. These requirements were developed before the staff and industry had the benefit of Probabilistic Risk Assessments (PRAs) and performance-based methods such as fire modeling.

REVISED REGULATION

The revised regulation is based on a national consensus standard, the National Fire Protection Association's (NFPA) Standard 805 (NFPA 805), *Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants* [Ref. 4]^b. The revised rule was approved by the Commission in May 2004 and became effective on June 16, 2004. The rule is voluntary and should reduce exemptions and unnecessary regulatory burden associated with the existing deterministic approach.

^a This paper was prepared by a NRC employee. The views presented do not represent official Agency position and the NRC has neither approved nor disapproved of its technical content.

^b The revised rule is commonly referred to as the "NFPA 805 Rule."

The Enforcement Policy was also revised to provide enforcement discretion for up to three years to transition [Ref. 5].

IMPLEMENTATION

Two pilot plants were chosen, Oconee Nuclear Station and Shearon Harris Nuclear Power Station, to gain experience from plant specific application of the risk-informed, performance-based methods. A Regulatory Guide (RG) was published, RG 1.205, *Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants* [Ref. 6], to provide guidance on acceptable ways to comply with the new rule. The Nuclear Energy Institute (NEI) developed NEI 04-02, *Guidance for Implementing a Risk-Informed, Performance Based Fire Protection Program under 10 CFR 50.48(c)*, [Ref. 7] and this guidance is endorsed by RG 1.205.

The NRC worked with industry to develop new risk-informed, performance-based tools. Some example are; NUREG/CR-6850, *Fire PRA Methodology for Nuclear Power Facilities* and the draft NUREG-1824, *Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications* [Refs. 8 & 9].

RESULTS

As of August 2006, eleven utilities have submitted letters of intent to transition forty-one units to the NFPA 805 rule. Some utilities are transitioning all of their nuclear sites in a staggered fashion to better utilize their staff during transition. Other utilities

are transitioning single sites that need the flexibility this rule provides. The pilots started their evaluations in the spring 2005 and plan to request transition to the new licensing basis in the spring 2008. Most other licensees started transitioning in November and December 2005 and will also take 3 years to submit a license amendment request to transition to the new NFPA 805 rule.

Two Observation Visits have been conducted at the pilot plants resulting in a number of lessons learned. A Frequently Asked Question (FAQ) process has been set up to confirm improvements to the implementation guidance and further communicate the lessons learned to industry. Both pilots are well into developing their fire PSAs including site partitioning, fire ignition frequencies, and component selection in accordance with NUREG/CR-6850 [Ref. 8].

NFPA 805 Public Workshops have been conducted to allow non-pilot licensees to discuss their progress and implementation issues. These workshops provide increased communication with NRC Staff and more interaction with the Regional inspectors.

Progress is continually being made to increase communication between the NRC and Industry. By utilizing the FAQ process, Observation Visits, Public Workshops, Information Forums, and Association Meetings, the NRC Staff is working to resolve implementation issues and have the NFPA 805 rule be a success.

REFERENCES

1. U.S. NRC, SECY-04-0050, Final Rule: Revision of 10 CFR 50.48 to Allow Performance-Based Approaches using National Fire Protection Association (NFPA) Standard 805 (NFPA 805), "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition. Washington, DC, 2004
2. Title 10, *Energy*, Code of Federal Regulation, Part 50, *Domestic Licensing of Production and Utilization Facilities*, Section 48, *Fire protection*, Paragraph (c), *National Fire Protection Association Standard 805*
3. Title 10, *Energy*, Code of Federal Regulation, Part 50, *Domestic Licensing of Production and Utilization Facilities*, Section 48, *Fire protection*, Paragraph (b) and Appendix R, *Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979*.
4. NFPA 805, *Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants*, 2001 Edition, National Fire Protection Association, Quincy, Massachusetts.
5. Federal Register Notice, Volume 71, Page 19905, *NRC Enforcement Policy: Extension of Discretion Period of Interim Enforcement Policy*, April 2006

6. U.S. NRC Regulatory Guide 1.205, *Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants*, Washington, DC, May 2006
7. NEI 04-02, *Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program under 10 CFR 50.48(c)*, Revision 1, Nuclear Energy Institute, Washington DC, November 2005
8. NUREG/CR-6850, (EPRI 1011989), *EPRI/NRC-RES: Fire PRA Methodology for Nuclear Power Facilities*, U.S. NRC, Washington, DC, and Electric Power Research Institute, Palo Alto, CA, September 2005
9. NUREG-1824, (EPRI 1011999), *EPRI/NRC-RES: Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications*, 7 Volumes, U.S. NRC, Washington, DC, and Electric Power Research Institute, Palo Alto, CA, Draft Report for Public Comment, February 2006