



# Fire Protection

**EPM has extensive experience and a proven track record resolving issues related to fire protection and offers expert guidance in achieving regulatory compliance using the most cost effective approaches. From developing complete fire protection programs to individual on-site staff augmentation assistance, EPM supports all aspects of our clients' Fire Protection programs.**

- + Audits, Inspections, Assessments
- + Code Consulting
- + Design Basis Documentation
- + Exemption Request Evaluation and Development
- + Fire Barrier Integrity Assessment
- + Fire Impact Assessment
- + Fire Modeling
- + Fire PRA
- + Fire Suppression and Fire Alarm System Design
- + Hydraulic Calculations
- + Long-Term Compliance Assessment
- + NFPA 805
- + Penetration Seal Programs
- + Pre-Fire Plans
- + RIS 2004-03
- + Risk Assessment
- + Safe Shutdown/Appendix R Analysis
- + Software (Safe Shutdown Analysis): SAFE
- + Suppression Effects Analysis
- + Staff Augmentation
- + System Design
- + Training

**NFPA 805** - The NFPA 805 standard provides the methodology to transition from an existing deterministic safe shutdown analysis to the newly proposed alternate rule to 10 CFR 50.48. The new rule is a risk-informed, performance-based approach to address fire protection and fire-induced safe shutdown for light water reactors and provides more flexibility for a utility to meet fire protection requirements. EPM is a principal member of the NFPA 805 committee and has made substantial contributions to the development of the standard. EPM has performed several NFPA 805 feasibility assessments and is currently performing NFPA 805 transition projects at multiple units.

**Safe Shutdown/Appendix R Analysis** - EPM has been providing Appendix R/safe shutdown-related engineering services since it was established in 1980. EPM has performed Appendix R review and reanalysis of safe shutdown capabilities for one-third of all U.S. nuclear power plants and for all but four units in Canada. As a result, over 400 exemption requests have been written in the U.S. Of these 400 exemption requests, over 90% were approved. Given our extensive experience in this area, EPM pioneered a risk-informed/performance-based methodology for safe shutdown and fire hazards analyses. EPM's methodology is centered on identification of an analysis of realistic fire scenarios rather than postulating an "all consuming fire." EPM's approach is based on recognized industry methods and techniques for risk assessment and simplified fire modeling.

**Fire Protection Audits, Inspections, Assessments** - EPM provides audit, assessment, and inspection services for many of the program areas for which it provides services including:

- Annual, Biennial, Triennial Fire Protection Audits
- NRC Required Special Audits to Assess Recurring Program Deficiencies
- NRC Inspection Procedure 71111.05, Fire Protection
- NEI 00-01, Guidance for Post-Fire Safe Shutdown Analysis
- NEI 04-02, Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48
- RIS 2004-03, Risk-Informed Approach for Post-Fire Safe Shutdown Associated Circuit Inspections

EPM's staff includes SFPE Member Grade fire protection engineers, along with mechanical and electrical engineers skilled in Appendix R conformance strategies, to either independently conduct or participate in audits and inspections. Depending on the specific requirements identified by our clients, EPM also has individuals who are qualified to perform the functions of QA Lead Auditors per the criteria of ANSI N45.2.23-1978.

**Design Basis Documentation** - EPM has provided design basis reconstitution services for numerous nuclear plants in the U.S. and Canada. EPM prepares Design Basis Documents (DBD) that result in an efficient information system that encompasses fire protection regulatory compliance issues by providing a detailed guide to fire protection program documents.

**Fire Modeling** - EPM has expertise in state-of-the-art fire modeling software including Fire Dynamics Simulator (FDS) and CFAST. EPM has utilized fire modeling extensively in support of performance-based analysis. For plants in Canada, fire modeling tools similar to those found in the EPRI FIVE Methodology (EPRI TR-100370) were used to evaluate the plant hazards and their impact on plant safe shutdown. As part of NFPA 805 pilot assessments and RIS 04-03 assessments, EPM has utilized the fire models provided in NUREG 1805, "Fire Dynamics Tool (FDTs) Quantitative Fire Hazard Analysis Methods for the U.S. NRC Fire Protection Inspection Program," to predict the extent of fire damage from various fire sources.

**Fire PRA** - The new regulatory environment encourages increasing the use of PRA technology in all regulatory matters. EPM's Fire Probabilistic Risk Assessment (PRA) approach consists of an integrated assessment of the acceptability of risk, defense-in-depth, and safety margins. A Fire PRA is conducted by identifying fire scenarios that may affect the safe operation of the plant (through impacts on equipment and human actions) and estimating the frequency of occurrence of those scenarios. Transition to NFPA 805 allows for the use of fire risk evaluation (Fire PRA) to evaluate the effects of fire on the ability to achieve nuclear safety performance criteria.

**Pre-Fire Plans** - EPM develops pre-fire plans which identify (both graphically and through text) the important

hazards and safety equipment in each area of the plant, along with cautions and procedures for certain fire fighting functions. These are used as reference documents for emergency responders during a fire scenario and as training documents to familiarize all personnel with plant configuration and hazards.

**RIS 04-03** - In December 2004, the NRC issued Regulatory Issue Summary 2004-03 Rev. 1 (RIS 04-03: "Risk-Informed Approach for Post-Fire Safe Shutdown Associated Circuit Inspections") which provides guidance for a risk-informed approach for post-fire safe shutdown associated circuit inspections. Having completed RIS assessments for several clients, EPM has the experience to perform the activities required to assess the impact of the RIS on a plant's Appendix R analyses utilizing a methodology that meets the intent of NEI-04-06, Draft G (which provides general guidelines for assessing the impact of the RIS on the fire safe shutdown program).

**Safe Shutdown Analysis Software: SAFE & SAFE PB** - SAFE is an engineering software tool that automates and maintains a nuclear power plant's deterministic or performance-based Safe Shutdown Analysis. SAFE allows an engineer to determine the effects of a fire — in any fire area, fire zone, building, room, or any other space suitable for the analysis — on the ability to safely shut down the plant. SAFE is one component of EPM's *GENESIS Solution Suite*® which is designed to effectively support nuclear power plants with 10 CFR 50 Appendix R compliance and to model and analyze other program assessments that are location driven (such as Environmental Qualification, Fire Probabilistic Risk Assessment (PRA), IPEEE FIVE, etc.) SAFE supports all of today's analysis requirements and presents information on an as-required basis and in a manner praised by the regulator.

EPM has been a continuous participant in the development of nuclear power plant fire protection criteria in the United States. In the early 1980s, EPM was a founder of the Nuclear Utility Fire Protection Group (NUFPG), a consortium of 20 U.S. utilities and 35 nuclear units, who together helped to develop the major guidance documents which defined acceptable methods to achieve compliance with U.S. fire protection requirements. Since that time, EPM has been a contributor to the major program changes and upgrades through the present day including the development of NFPA 805. EPM has provided fire protection services to more than 60% of the nuclear power plants in the U.S. and 90% of the nuclear power plants in Canada, as well as nuclear power plants in the Ukraine, Russia, Armenia, and Korea. EPM is also well-regarded by U.S. and Canadian regulators; the Nuclear Regulatory Commission (NRC) and the Canadian Nuclear Safety Commission (CNSC) have requested EPM's services on several occasions.

For more information contact Tom Jutras at:



Engineering Planning and Management, Inc.

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