



TAEC-NRC Bilateral Exchange Status of Changes and Guidance Related to 10 CFR 50.48

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US Nuclear Fire Protection Background

- 1971 – Atomic Energy Commission Fire Protection General Design Criteria
- 1975 - Browns Ferry Fire
- 1980 - 10 CFR 50.48, Appendix R
- 1998 - Reg. Guide 1.174, Probabilistic Risk Assessment
- 2001 - National Fire Protection Association (NFPA) 805, Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants

Outline for Today

- Risk-Informing Current Licensing Basis
 - Appendix R Exemptions
 - Operator Manual Actions
 - Associated Circuits
- New Voluntary Risk-Informed Option
 - National Fire Protection Association 805

Appendix R Exemptions

- Exemptions to regulations allowed by 10 CFR 50.12
 - Specifically, for those cases that would result in undue hardship or costs that is significantly in excess of those contemplated when the regulation was adopted.
- Risk-Informed exemptions are evaluated using Regulatory Guide (RG) 1.174 principles of integrated decision-making incorporating:
 - Defense-in-depth philosophy
 - Maintaining safety margins
 - Result in small changes in core damage frequency (CDF) and consistent with NRC Commission Safety Goal Policy
 - Use of performance measurement strategies to ensure no adverse safety degradation occurs
- Until recently, NRC has received no risk-informed Appendix R exemption requests. One request is currently being reviewed.

Operator Manual Actions Definition

- Manipulation of equipment from outside the main control room (MCR) to achieve and maintain post-fire safe shutdown. These actions are performed locally by operators, typically at the equipment.

Operator Manual Actions Background

- 10 CFR 50.48 imposed fire protection (FP) requirements from App. R, Paragraph III.G.2, to pre-1/1/1979 licensed plants
 - Three acceptable methods to protect at least one shutdown train during a fire when redundant trains are located in same fire area
 - 3-hr passive fire barrier
 - 20-ft separation and no intervening combustibles, with fire detection and automatic suppression
 - 1-hr passive fire barrier with fire detection and automatic suppression

Operator Manual Actions Background (cont.)

- For post-1/1/1979 licensed plants, App. R provisions were incorporated into Branch Technical Position (BTP) CMEB-9.5-1 and NUREG-0800 (Standard Review Plan)
- To address FP issues related to Thermo-Lag barriers in mid-1990s, some licensees credited “operator manual actions” for III.G.2 rather than provide fire barriers and/or separation with detection/suppression, or seek an exemption

Operator Manual Actions Background (cont.)

- Since advent of Reactor Oversight Process, in 2000, NRC FP inspections have found enough licensees relying on unapproved operator manual actions to raise a III.G.2 compliance concern
- More importantly, some of these operator manual actions may not have been shown to be feasible, thereby creating doubt that safe shutdown could be assured

Operator Manual Actions Background (cont.)

- In March 2003, NRC issued FP Inspection Procedure, Attachment 71111.05, Enclosure 2 – *Inspection Criteria for FP Manual Actions*, based on inspection experience, that addressed
 - Diagnostic instrumentation
 - Environmental considerations
 - Staffing and Training
 - Communications and Accessibility
 - Procedures
 - Verification and validation

Operator Manual Actions Background (cont.)

- In June 2003, NRC issued SECY-03-0100, *Rulemaking Plan on Post-Fire Operator Manual Actions*, to revise the FP program requirements contained in Appendix R of 10 CFR Part 50, III.G.2
- In September 2003, the Commission issued a Staff Requirements Memorandum (SRM) on SECY-03-0100 approving “the staff’s recommendation to proceed with rulemaking”

Operator Manual Actions Proposed Acceptance Criteria

- Available indications
- Environmental considerations
- Staffing and Training
- Communications
- Equipment
- Procedures
- Demonstration (i.e., walkdowns, time margin)
- Complexity and number

Operator Manual Actions Bases

- NRC Significance Determination Process
- NRC FP Inspection Procedure –
Inspection Criteria for FP Manual Actions
- Sandia Report, Risk Insights Related to
Post-Fire Operator Manual Actions
- Human Reliability Analysis
 - Insights from Advisory Committee on Reactor
Safeguards Sub-committee on FP

Operator Manual Actions Path Forward

- Develop final acceptance criteria for operator manual actions considering additional input from
 - Office of Nuclear Regulatory Research
 - Office of Enforcement
 - Advisory Committee on Reactor Safeguards
 - FP Sub-committee
 - External stakeholders
 - Public
 - Industry

Operator Manual Actions Schedule

- Interim enforcement discretion
 - *Federal Register Notice* with public comment period, November 2003 through January 2004
 - Commission approval on policy in 2004
- Final rulemaking
 - Rule scheduled for 2006
 - *Federal Register Notice(s)*, with public comment periods for stakeholder feedback

Associated Circuits Definition

- Associated circuits are not required for safe shutdown.
- Associated circuits are circuits that could prevent operation or cause maloperation of equipment due to a fire-induced failure.
 - Hot shorts
 - Shorts to ground
 - Open circuits

Associated Circuits Background

- 10 CFR Part 50, Appendix R/NUREG 0800 Standard Review Plan.
 - Licensees are required to provide reasonable assurance that **Fire-Induced Circuit Failures** that could adversely affect the ability to achieve and maintain post-fire safe shutdown will not occur.
- Information Notice 99-17, Problem Associated with Post-Fire Safe Shutdown Circuit Analyses.
 - Recent problems with associated circuits at a number of licensees
- November 2000, NRC suspends associated circuit inspection.
 - Confusion in industry about Appendix R requirements
 - NRC determines that issue is generic
 - Work with stakeholders to solve the issue in a risk-informed manner

Associated Circuits Background

- **Nuclear Energy Institute (NEI) Fire Testing**
 - 18 full-scale fire tests
 - May 2002, Electric Power Research Institute (EPRI) published "Spurious Actuation of Electrical Cables to Cables Fire: Results of Expert Elicitation."
 - Tests showed that spurious operation is more credible than previously thought
- **February 2003, Facilitated Public Workshop**
 - Consensus on the Most Risk Significant Associated Circuit Scenarios
 - Identify Most Risk Significant Cable Configurations and Attributes
- **August 2003, Draft Regulatory Issue Summary (RIS)**
 - Technical input for Risk-Informing Associated Circuit Inspections
 - Issued for public comment
- **January 2004, Draft NUREG-1778**
 - Knowledge Base Post-Fire Safe-Shutdown Analysis
 - Issued for public comments
- **March 2004, Final RIS (2004-03) issued**

Associated Circuits

Risk of Spurious Operation

- Risk = (Fire Frequency) x (Likelihood of fire effects & cable attributes that contribute to failure) x (Likelihood of undesired consequences).
- Not all cable attributes are equal
 - Intra-cable interaction is more likely than inter-cable interaction
 - Cable construction is important (thermoplastic vs. thermoset)
- Most Risk Significant Consequences
 - Failures that Impede Hot Shutdown within the First Hour of the Event
 - Flow Diversion
 - Loss of Coolant

Associated Circuits Remaining Activities

- Issue Final NUREG-1778 (May/June 2004)
- Conduct Public Workshop (Spring/Summer 2004)
- Issues Requiring Further Research (FY 05/06)

NFPA 805

Overview

- Sets performance goals and criteria
 - Goals and criteria for nuclear safety, radioactive release, life safety, and plant damage/business interruption
- Goals and criteria are achieved using risk-informed, performance-based or a deterministic approach
- Focuses on risk significant non-compliance issues
- Maintains a core FP program (e.g. training, drills, procedures, etc.)
- Endorses a National Fire Protection Association Consensus Standard
 - National Technology Transfer and Advancement Act of 1996 promoting a greater reliance on voluntary standards
- Reduces unnecessary regulatory burden associated with Appendix R

NFPA 805

Rule Structure

- Adds NFPA 805, 2001 edition into the regulations (10 CFR 50.48) as a voluntary alternative to Appendix R
- Requires license amendment to adopt NFPA 805
- Must complete fire-area by fire-area evaluations
- Decommissioning plants may also choose to comply with NFPA 805 criteria
- Evaluations must be documented and retained for NRC inspection

NFPA 805

Current Status

- Proposed rule issued November 2002
- Comment period ended January 2003
- Publish the Final Rule - Summer 2004
(Tentative)
- Draft Regulatory Guide - Summer 2004