

Resolution of Fire-Induced Circuit Failure Issues

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February 19, 2003



Topics

- Industry activities to resolve fire-induced circuit failure issues
- NEI 00-01
- Proposals for this workshop



Industry Resolution Activities

- Basic issue: difference of interpretation of regulatory guidance
- Early correspondence
 - March 11, 1997 NRC letter stating position
 - May 30, 1997 industry response stating position
- July 1998: NRC workshop to develop resolution pathway
 - Agreement that industry would develop risk-informed resolution method
- November 1999: BWROG submitted deterministic SSA method



Industry Resolution Activities

- April 2000: NEI provided first draft of NEI 00-01 to NRC
- January - May 2001: EPRI and NEI conducted 18 circuit failure tests
- October 2001: NEI provided second draft of NEI 00-01 to NRC



Industry Resolution Activities

- June 2002: EPRI published expert panel report (1006961) on circuit failure probabilities
- September 2002: Report on NEI 00-01 pilots completed, NEI responded to NRC comments on 2nd draft NEI 00-01
- October 2002: NEI provided 3rd draft NEI 00-01 to NRC
- December 2002: EPRI published final report (1003326) on circuit failure testing



Purposes of NEI 00-01

- NEI 00-01 intended to
 - Provide a comprehensive method for performing safe shutdown analysis from a deterministic standpoint
 - Provide a method for licensees to resolve circuit failure issues through the assessment of their risk significance
- NEI 00-01 not intended for wholesale re-examination of plant safe shutdown analysis



Contents of NEI 00-01

- Main body
 - 1: Introduction
 - 2: Appendix R Requirements and Considerations
 - 3: Deterministic Methodology
 - 4: Risk Significance Analysis
 - 5: Definitions
 - 6: References



Contents of NEI 00-01

■ Appendices

- A: Safe Shutdown Analysis as Part of an Overall Fire Protection Program
- B: Deterministic Circuit Failure Characterization
 - B.1: Justification for the Elimination of Multi-Conductor Hot Shorts Involving Power Cables
 - B.2 Justification for the Elimination of Multiple High Impedance Faults

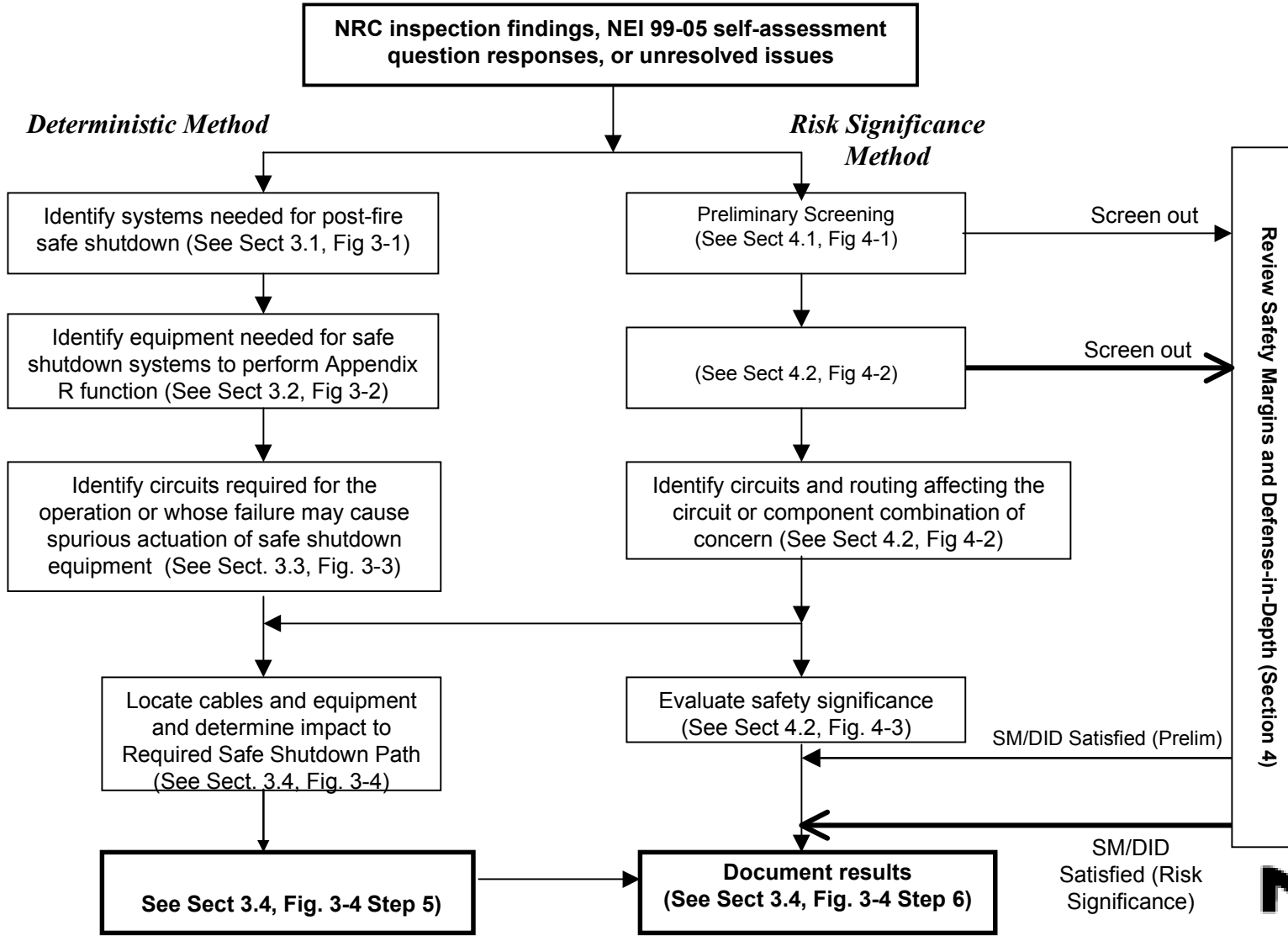


Contents of NEI 00-01

- Appendices (continued)
 - C: High/Low Pressure Interfaces
 - D: Alternative/Dedicated Shutdown Requirements
 - E: Manual Actions and Repairs
 - F: Supplemental Selection Guidance
 - G: Basis for Qualitative Screening



**Figure 1-1
NEI 00-01 Process Flow Chart**



Use of NEI 00-01

- General guidelines for document use
 - Use is at licensee's option
 - Not intended to expand existing, approved licensing basis
 - Intended for use on identified specific issues (NRC or licensee identified)
 - Can at any time place issue into Corrective Action Program or perform further risk significance screening



Use of NEI 00-01

- For issues clearly within licensing basis:
 - If risk significant, licensee should
 - ◆ Address through the CAP
 - ◆ Follow appropriate reporting requirements
 - If not risk significant, licensee should address through the CAP or submit exemption/deviation request



Use of NEI 00-01

- If issue not clearly within plant licensing basis:
 - If risk significant, licensee should address through the CAP
 - If not risk significant:
 - ◆ No action required
 - ◆ Document analysis



Use of NEI 00-01

- General guidelines for use of deterministic method
 - Typically licensed, commonly used safe shutdown analysis methodology
 - ◆ Assumptions/guidelines similar to those currently used
 - Not intended for wholesale re-evaluation of safe shutdown analysis
 - ◆ Approved safe shutdown analysis assumed



Use of NEI 00-01

- Use of risk significance methods
 - Can be used with any deterministic method
 - Can be used to address identified single or multiple spurious actuation issues
 - Must consider all fire areas where combination exists
 - SM/DID analysis must be performed before screening out any combination



Future Resolution Activities

- NEI 00-01 provides robust risk-informed method for resolving circuit failure issues

- NRC should accept final revision for use by licensees
 - Revision will address current NRC and industry comments
 - Expect to submit in 1-2 months
 - Acknowledge deterministic sections as meeting the current regulatory requirements
 - Acknowledge the risk significance methods as an acceptable means for addressing the significance of specific configurations of concern, in conjunction with ROP



Future Resolution Activities

- Goal: Clearly understood resolution methods by NRC and licensees
- Needs:
 - Revise NEI 00-01
 - Address pathway for NEI 00-01 acceptance
 - ◆ Existing regulations
 - ◆ NFPA 805
 - Prepare inspection guidance and conduct training
 - Address existing URIs
 - Address safety significance determination



Industry Goals for This Workshop

- Provide input to revised inspection guidance
 - Circuit failure scenarios where inspection not required
 - Circuit failure scenarios with potential risk significance and inspection priority
 - Circuit failure scenarios requiring further study
- Propose process for industry input to revised guidance
 - Goal: Clear understanding of inspection goals and expectations by both inspectors and licensees
- Propose process for addressing scenarios requiring further study



Areas Where Inspection Not Required

- Multiple spurious actuations for any thermoset or armored multiconductor cable involving a single component with current limiting devices such as Control Power Transformers (CPTs).



Areas Where Inspection Not Required

- Any spurious actuations for the following scenarios:
 - Any thermoset cable exposed to a fire less than 450 kW for less than 15 minutes
 - Armored cable with fuses
 - Cable-to-cable fire-induced spurious actuations for armored or thermoset cable
 - Any fire that can be shown to be less than:
 - ◆ 680 °F for thermoset cable
 - ◆ 400 °F for thermoplastic cable
 - ◆ 570 °F for armored cable
 - 3-phase hot shorts for any component including high/low pressure interfaces
 - DC motors
 - AOVs and PORVs that return to the desired position with power removed

Areas Where Inspection Not Required

- Multiple High Impedance Faults (MHIFs)
- Open circuits as an initial fire-induced failure mode



Areas of Inspection Interest

- Simultaneous spurious actuations in a single multiconductor cable containing circuits for components whose simultaneous failure has significant consequences



Areas of Inspection Interest

- Single spurious actuations meeting all of the following criteria:
 - Spurious actuation has high consequences
 - Inability to demonstrate fire can be kept below 450 KW after 15 minutes (thermoset cable)
 - Circuit not protected by CPT or other current limiting device



Areas Requiring Additional Analysis

- The NEI 00-01 risk methods should be utilized to determine the significance of these
 - Additional testing may not be warranted
 - Current risk significance methods adequate
- Potential scenarios not addressed in the first two categories should be considered here. Examples:
 - High consequence scenarios
 - Instrument cable concerns
 - Switchgear, MCC and panel fire scenarios

