

(R4)

4(b)

**From:** Richard Barrett RES  
**To:** Bahadur, Sher; Boger, Bruce; Borchardt, Richard; Cupidon, Les; Federline, Margaret; Glitter, Joseph; Gwynn, Pat; Wiggins, James; Winsberg, Kathryn  
**Date:** Thu, May 4, 2006 12:04 PM  
**Subject:** Re: Staff Revised CRGR #408 (April 25) Package

**UPDATE:**

I met with NRR staff late this morning, and I am satisfied that we have the authority to request licensees in a GL to submit corrective action plans. We can do this whether or not we cite 50.54f. NRR made some modifications to the text under "REQUESTED ACTIONS" to make it clear that the requirement to take corrective action stems from Appendix B and their fire protection plan, not from the request in the GL.

Issue resolved.

--Rich

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NRR staff disagree with my comments that the some of the GL language oversteps the authority of 50.54f. We are meeting today to discuss their rationale. Hopefully, we can come to agreement; otherwise, there may be a need to poll the CRGR on the issue before finalizing the GL and holding the final meeting.

--Rich

✓ >>> Les Cupidon 05/04/06 7:59 AM >>> RES  
CRGR,

Attached is the redline strikeout revised version of the April 25th, CRGR #408 package (GL, comment resolution and Appendix C of CRGR Q&A). Please verify if your concerns and recommendations have been address so that staff may proceed.

Thank you  
Les

**CC:** Markley, Anthony; Weerakkody, Sunil; Wolfgang, Robert

A-2

OMB Control No.: 3150-0011

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION  
WASHINGTON, DC 20555

NRC GENERIC LETTER 2006-XX: POST-FIRE SAFE-SHUTDOWN CIRCUIT ANALYSIS  
SPURIOUS ACTUATIONS

**ADDRESSEES**

All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

**PURPOSE**

The U.S. Nuclear Regulatory Commission (NRC) is issuing this generic letter (GL) to:

- (1) Request addressees to review their fire protection program to confirm compliance with applicable regulatory requirements regarding their interpretation of multiple spurious actuations caused by hot shorts, ~~the phrase "one-at-a-time"~~ in light of the information provided in this GL and, if appropriate, take additional actions to return to compliance. Specifically, although some licensees have performed their post-fire safe-shutdown circuit analyses based on an assumption of only a single spurious actuation per fire event or that spurious actuations will occur with sufficient time between them for operators to take corrective actions, (commonly referred to by the NRC and industry as "one-at-a-time") ~~"one-at-a-time,"~~ recent industry cable fire test results demonstrated that these assumptions are not valid.
- (2) Require addressees to submit a written response to the NRC in accordance with NRC regulations in Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f).

The reason for this request is ~~that~~ to reaffirm the NRC position that multiple spurious actuations caused by hot shorts must be considered and evaluated per 10 CFR 50.48 and 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 3. This position was confirmed by the results of the Electric Power Research Institute (EPRI)/Nuclear Energy Institute (NEI) cable fire tests, which showed a relatively high probability of multiple spurious actuations occurring simultaneously or in rapid succession during or after a fire (see EPRI Report No. 1006961, "Spurious Actuation of Electrical Circuits Due to Cable Fires: Results of an Expert Elicitation," dated May 2002 and NUREG/CR-6776, "Cable Insulation Resistance

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GL 2006-XX  
Page 2 of 12

GL 2006-XX  
Page 3 of 12

Measurements Made During Cable Fire Tests," dated June 2002). Some licensees have assumed a single spurious actuation per fire event, and others have assumed that multiple spurious actuations can only occur "~~one-at-a-time~~," with sufficient time between actuations to allow for mitigation. The EPRI/NEI test data clearly show that the "~~one-at-a-time~~" spurious actuation assumption that there is sufficient time between actuations to allow for mitigation between multiple spurious actuations is not appropriate. If licensees have not considered multiple spurious actuations occurring simultaneously or in rapid succession during or after a fire in their post-fire safe-shutdown circuit analysis, they may not be in compliance with 10 CFR 50.48 and 10 CFR Part 50, Appendix A, ~~General Design Criterion (GDC) 3~~, which require that structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. Licensees who conclude that they are no longer in compliance with 10 CFR 50.48 and 10 CFR Part 50, Appendix A, GDC 3, based on the information provided in this GL, should implement compensatory measures and inform the staff of their planned corrective actions to return to compliance with 10 CFR 50.48 and 10 CFR Part 50, Appendix A, GDC 3.

## BACKGROUND

The regulatory requirements for post-fire safe shutdown are given in 10 CFR 50.48 and 10 CFR Part 50, Appendix A, GDC 3. Additionally, all nuclear power plants (NPPs) licensed to operate before January 1, 1979, are required to comply with 10 CFR Part 50, Appendix R, Section III.G, "Fire Protection of Safe Shutdown Capability." All NPPs licensed to operate after January 1, 1979, were evaluated against Section 9.5.1 of NUREG-0800, the Standard Review Plan. The fire protection plan (FPP) and the associated safety evaluation report (SER) are specifically incorporated into those plants' licensing bases. All NPP licensees are responsible for meeting fire protection and license condition commitments made during the establishment of their fire protection program.

The objective of the fire protection requirements and guidance is to ensure that one train of systems necessary to achieve and maintain safe shutdown free of fire damage. To do so, licensees must protect circuits whose fire-induced failure could prevent the operation, or cause maloperation, of equipment necessary to achieve and maintain post-fire safe shutdown. As part of its fire protection program, each licensee performs a circuit analysis to identify these circuits and to provide adequate protection against fire-induced failures.

Beginning in 1997, the NRC staff noticed that a series of licensee event reports (LERs) identified plant-specific problems related to potential fire-induced electrical circuit failures that could prevent operation, or cause maloperation, of equipment necessary to achieve and maintain safe shutdown. The staff documented these problems in Information Notice (IN) 99-17, "Problems Associated With Post-Fire Safe-Shutdown Circuit Analyses." Based on the number of similar LERs, the NRC treated the issue generically. In 1998 the NRC staff started to interact with interested stakeholders in an attempt to understand the problem and develop an effective risk-informed solution to the circuit analysis issue. NRC also issued Enforcement Guidance Memorandum 98-002, Rev. 2 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML003710123), to provide a process for treating inspection

GL 2006-XX  
Page 4 of 12

findings while the issues were being clarified. Because different stakeholders interpreted the

GL 2006-XX  
Page 5 of 12

regulations differently, the NRC decided to temporarily suspend the associated circuit part of fire protection inspections. This decision is documented in an NRC memorandum from John Hannon (Chief, Plant Systems Branch, Office of Nuclear Reactor Regulation (NRR)) to Gary Holahan (Director, DSSA, NRR) dated November 29, 2000 (ADAMS Accession No. ML003773142).

In 2001 EPRI and NEI performed a series of cable functionality fire tests to further the nuclear industry's understanding of fire-induced circuit failures, particularly spurious equipment actuations initiated by hot shorts. EPRI coordinated this effort and issued the final report (EPRI Report No. 1006961). Additional analysis of the EPRI/NEI test results can be found in NUREG/CR-6776. Based on the test results, the NRC staff and NEI concluded that the probability of fire-induced circuit failures can be relatively high and that there can be a relatively high probability of multiple spurious actuations occurring simultaneously or in rapid succession.

## DISCUSSION

Although both the NRC and the industry have used the phrase "one-at-a-time" in connection with post-fire spurious actuations caused by hot shorts, it is not defined in 10 CFR Part 50 regulations or fire protection guidance documents. The phrase has been used in at least two different senses. Some licensees have used "one-at-a-time" to mean that only one spurious actuation need be postulated for any single fire event. Other licensees have used the phrase to mean that multiple spurious actuations do not occur simultaneously and that there is sufficient time between spurious actuations for operators to take corrective actions. NRC has issued SERs that accepted both interpretations for specific situations in specific plants (e.g., NUREG-0876, Supplement No. 6, "Safety Evaluation Report Related to the Operation of Byron Station, Units 1 and 2," ADAMS Accession No. 8411200507). However, the NRC staff has interpreted the regulations to mean that these interpretations are only allowed with respect to the design of alternate shutdown capability. The EPRI/NEI cable fire testing conducted in 2001 demonstrated that neither interpretation conforms with the likely effects of a fire in an area containing safe-shutdown cables. Therefore, these interpretations do not ensure safe shutdown.

In the S.J. Collins (NRC) letter to R.E. Beedle (NEI) dated March 11, 1997 (ADAMS Accession No. ML003716454), the NRC reiterated its position that multiple spurious actuations caused by hot shorts must be considered and evaluated. Subsequent to the Collins letter, the 2001 EPRI/NEI fire testing demonstrated that multiple spurious actuations can occur with a relatively high probability and that they can occur simultaneously or in rapid succession without sufficient time for mitigation between actuations.

One of the key observations of the EPRI test report (EPRI Report No. 1006961) was that, "given that a hot short occurs in a multi-conductor cable, it is highly probable (over 80 percent) that multiple target conductors will be affected (i.e., multiple simultaneous dependent hot shorts)." The testing covered most of the types of cable insulation and jacketing materials and the types of raceways commonly used in nuclear power plants. During the testing, numerous variables were introduced to investigate the impact of various factors on cable performance and failure characteristics.

GL 2006-XX  
Page 6 of 12

While the staff has maintained that post-fire multiple spurious actuations should be considered, the number of actuations that must be considered has not been defined. Since the deterministic approach to post-fire safe-shutdown analyses assumes that all cables in a fire area are damaged by the fire (except where III.G.2 protection described in 10 CFR 50, Appendix R, paragraph III.G.2 is provided) (separation of cables with a 3-hour fire barrier, physical separation of cables of redundant trains by 20 feet, or separation of cables with a 1-hour fire barrier and fire suppression and detection), it follows that all possible spurious actuations, as well as the cumulative effect of the actuations, should be considered.

The SERs incorporated into the licensing bases of Byron Station, Units 1 and 2 and Braidwood Station, Units 1 and 2 specifically allow a design assumption of a single spurious actuation per fire event in the post-fire safe-shutdown circuit analysis. However, most plants postulated in their licensing basis that multiple spurious actuations occur with sufficient time between spurious actuations for operators to take corrective actions. ~~"one-at-a-time."~~ All licensees should review their circuits analysis to verify that it assumes the possibility of simultaneous multiple spurious actuations during a fire. Depending on the results of this review, licensees may conclude that they are no longer in compliance with the fire protection regulations. Licensees who so determine should implement compensatory measures and inform the staff of their plan of corrective actions to return to compliance with 10 CFR 50.48 and 10 CFR Part 50, Appendix A, GDC 3. One acceptable corrective action is to make plant modifications to protect against possible multiple spurious actuations. Another is to justify request an exemption (or license amendment, as applicable) as described in the Methods Of Compliance section of this GL.

The NEI letter of May 30, 1997, presents the industry's position on the phrase "one-at-a-time." The industry's position is that "possible functional failure states from a single hot short in the component's control circuitry should be analyzed "one-at-a-time" (not sequentially nor with cumulative consequences) for a fire in a certain fire area." As one basis for this position, the letter references the response to Question 5.3.10 in GL 86-10, "Implementation of Fire Protection Requirements." Although this response states that "the safe shutdown capability should not be adversely affected by any one spurious actuation or signal resulting from a fire in any plant area," per Question 5.3.10, the response applies only to Appendix R, Section III.L, "Alternative and Dedicated Shutdown Capability." The NRC emphasized this position in an April 30, 1982, letter from Dennis M. Crutchfield (Chief, Operating Reactors Branch #5, Division of Licensing) to P.B. Fiedler (Vice President & Director, Oyster Creek) (ADAMS Accession No. ML011150521) by stating that "it is essential to remember that these alternative requirements (i.e., III.G.3 and III.L) are not deemed to be equivalent" to protection required by 10 CFR Part 50, Appendix R, paragraph III.G.2 protection.

As noted in the attachment to a February 6, 1997, memorandum from L.B. Marsh (Chief, Plant Systems Branch, NRR) to J.F. Stolz (Director, Project Directorate I-2) regarding the NRC interpretation of the GL 86-10 guidance on spurious valve actuation, the reference to "any one spurious actuation" in the response to Question 5.3.10 is intended to provide a design basis for determining the capacity and capability of the alternative or dedicated shutdown train (e.g., the size of the pump and the support systems needed to maintain reactor coolant inventory, the scope of onsite electrical power distribution and power needs, and an operational baseline and set of plant conditions to define the scope of initial manual actions to restore systems

GL 2006-XX  
Page 7 of 12

necessary to accomplish the required reactor performance goals). Again, these alternative requirements do not provide the same level of protection as required by 10 CFR Part 50, Appendix R, paragraph III.G.2.

NEI also stated in the May 30, 1997, letter that "any other interpretation leads to complex and costly analysis which is not justified for the very small safety benefit." The NEI letter offered no assessment of the safety significance of multiple sequential and cumulative failures. It is important to note that the NEI letter of May 30, 1997, preceded the 2001 EPRI/NEI fire testing. As noted above, the cable functionality fire testing demonstrated that multiple spurious actuations can occur and that they can occur in rapid succession without sufficient time for mitigation. Therefore, if a licensee does not account for multiple spurious actuations in its circuits analysis, the licensee may not be in compliance with 10 CFR 50.48 and 10 CFR Part 50, Appendix A, GDC 3, which require that a licensee provide and maintain free of fire damage one train of systems necessary to achieve and maintain safe shutdown.

A bounding analysis on the potential fire risk in terms of core damage frequency (ADAMS Accession No. ML060830212) indicates that despite some likely conservative assumptions, multiple spurious actuations caused by hot shorts can be risk significant.

#### **METHODS OF COMPLIANCE**

Based on the information provided in this GL, if a licensee concludes that it is no longer in compliance with the fire protection regulations, there are several acceptable methods to reestablish full regulatory compliance. One way is to reperform the post-fire safe-shutdown circuit analysis based on guidance provided in this GL and make the necessary modifications. Another way to address this issue is to perform either a risk-informed evaluation that considers defense-in-depth and safety margins or a deterministic evaluation.

If a licensee proposes to use a risk-informed approach to justify an exemption or license amendment in accordance with 10 CFR 50.12, the licensee should follow the guidance of RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis."

Licensees who have adopted the standard fire protection license condition in GL 86-10 can make changes to the approved fire protection program without prior staff approval if the changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire. GL 86-10, "Implementation of Fire Protection Requirements," provides guidance on performing and documenting these changes. Plants licensed after January 1, 1979, that use a risk-informed approach must submit a license amendment in accordance with 10 CFR 50.90. The exception to 10 CFR 50.90, provided in the standard license condition and in 10 CFR 50.48(f)(3), does not apply because the risk assessment approaches used by these plants deviate from the approved deterministic approaches used in their licensing basis. Furthermore, the licensees' risk assessment tools have not been reviewed or inspected against quality standards found acceptable to the NRC staff. Consequently, the staff believes that the use of risk informed approaches should receive prior NRC approval.

An additional method to achieve compliance is the adoption of a performance-based fire

GL 2006-XX  
Page 8 of 12

protection program in accordance with 10 CFR 50.48(c), "National Fire Protection Association Standard NFPA 805." Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," dated September 2004 (ADAMS Accession No. ML042740308), and NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," Rev. 0, dated March 2006 (ADAMS Accession No. ML060600183), provide additional guidance to licensees who plan to use this option.

### **APPLICABLE REGULATORY REQUIREMENTS**

NRC regulations in 10 CFR 50.48 and 10 CFR Part 50, Appendix A, GDC 3, require each operating NPP (licensed before or after issuance of GDC 3) to have an FPP providing post-fire safe-shutdown capability. That is, a means must be provided of ensuring that one of the redundant trains of safe-shutdown structures, systems, and components is protected so that it remains free of fire damage, allowing safe shutdown of the plant. The regulation in 10 CFR 50.90 requires a licensee who desires to amend its license to submit an amendment request to the NRC. An NPP licensed to operate before January 1, 1979, may submit an exemption request in accordance with 10 CFR 50.12.

All NPPs licensed to operate before January 1, 1979 (pre-1979 plants), are required to comply with 10 CFR Part 50, Appendix R, paragraph III.G, "Fire Protection of Safe Shutdown Capability." Paragraph III.G states, in part, that "one train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage." Paragraph III.G.2 states, in part, that "where cables or equipment, including associated non-safety circuits that could prevent operation or cause maloperation due to hot shorts, open circuits, or shorts to ground, of redundant trains of systems necessary to achieve and maintain hot shutdown conditions are located within the same fire area outside of primary containment, one of the following means of ensuring that one of the redundant trains is free of fire damage shall be provided." All NPPs licensed to operate after January 1, 1979, are required to comply with 10 CFR 50.48(a), which requires that each operating NPP have an FPP that satisfies GDC 3. The FPP is incorporated into the operating license for post-1979 plants as a license condition. This license condition specifically cites the staff SER in the licensee's FPP to demonstrate that the license condition has been met (although licensees may modify their FPP as long as there is no adverse effect on safe shutdown).

Based on the regulations that state that cables or equipment that could prevent operation or cause maloperation of a safe shutdown train of equipment due to hot shorts, open circuits, or shorts to ground must be protected, and the new information provided by the EPRI/NEI cable fire tests, approved fire protection programs that do not include protection against possible simultaneous occurrence of multiple spurious actuations (including programs for plants with SERs that specifically approve the assumption of a single spurious actuation per fire event) may not comply with these regulatory requirements.

### **APPLICABLE REGULATORY GUIDANCE**

Fire-induced hot shorts that cause spurious actuations can prevent a train of safe shutdown equipment from performing its post-fire safe-shutdown function. NRC regulations do not limit

GL 2006-XX  
Page 9 of 12

the number of spurious actuations that must be considered. In addition, NRC regulations do not state whether multiple spurious actuations should be assumed to occur simultaneously or sequentially. Licensees should adequately justify any limits or assumptions used in performing the post-fire safe-shutdown circuit analysis.

In order to demonstrate compliance with the regulatory requirement that one safe-shutdown train remain free of fire damage, licensees should analyze the potential for multiple, concurrent or in rapid succession spurious actuations and provide adequate protection where required.

Fire modeling techniques and risk analysis techniques which the staff has found acceptable are provided in Section 4.0 of Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," dated March 2006 (ADAMS Accession No. ML060600183) and may be used in the evaluations.

The deterministic methodology in NEI 00-01, Rev. 1 (January 2005), "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Chapter 3 (including the associated appendices), for analysis of post-fire safe-shutdown circuits, in conjunction with the guidance provided in this GL, is one acceptable approach to achieving regulatory compliance with post-fire safe-shutdown circuit protection requirements for multiple spurious actuations. Licensees should assume that the fire may affect all unprotected cables and equipment within the fire area simultaneously and address all cable and equipment impacts affecting the required safe-shutdown path in the fire area. All potential impacts within the fire area should be addressed.

The risk significance analysis methodology provided in Chapter 4 of NEI 00-01 should not be applied as a basis for regulatory compliance except where a National Fire Protection Association (NFPA) 805 licensing basis has been adopted in accordance with 10 CFR 50.48(c) or it is used to support exemption and license amendment requests for plants that have not adopted an NFPA licensing basis. Furthermore, regardless of the plant licensing basis, the NRC agrees with the NEI 00-01 guidance that "all failures deemed to be risk significant, whether they are clearly compliance issues or not, should be placed in the Corrective Action Program with an appropriate priority for action." The remaining sections of NEI 00-01 provide acceptable circuit analysis guidance on both the deterministic approach and the risk-informed, performance-based approach.

#### **REQUESTED ACTIONS**

All addressees are requested to take the following actions:

- (1) Within 90 days of the date of this letter, all addressees are requested to evaluate their licensing basis regarding multiple spurious post-fire safe-shutdown circuit analyses. Specifically, they are requested to compare the plant licensing basis to the regulatory requirement for protecting redundant safe-shutdown trains from multiple simultaneous spurious actuations and maintaining one train free of fire damage.
- (2) Based on the plant licensing basis and the information provided in this GL, addressees should reach a conclusion, within 90 days of the date of this GL, on whether the NPP is in compliance with regulatory requirements.

GL 2006-XX  
Page 10 of 12

- (3) If addressees conclude that their plants are not in compliance with regulatory requirements, they should, in accordance with their FPP, implement compensatory actions and prepare corrective action plans. These addressees should make plans within 6 months of the date of this letter for plant modifications, license amendments, exemption requests, or other means to meet regulatory requirements and the plant's licensing basis.

#### **REQUESTED INFORMATION**

All addressees are requested to provide the following information:

- (1) Within 90 days of the date of this GL submit a description of their licensing basis regarding multiple spurious post-fire safe-shutdown circuit analyses. Specifically, they should compare the plant licensing basis to the regulatory requirement for protecting redundant safe-shutdown trains from multiple simultaneous spurious actuations and maintaining one train free of fire damage.
- (2) Within 90 days of the date of this GL submit a conclusion based on the plant licensing basis and the information provided in this GL as to whether the NPP is in compliance with regulatory requirements.
  - a. If addressees conclude their plants are not in compliance with regulatory requirements, they should submit an assessment of the functionality of affected structures, systems, and components that addresses the ability to achieve and maintain safe shutdown in light of multiple spurious hot shorts as a result of a fire. An assessment consistent with an evaluation performed for RIS 2005-20 will be acceptable.
  - b. Addressees that conclude they are not in compliance with regulatory requirements should also submit a description of the compensatory measures in place to maintain the safe-shutdown function of affected areas of the plant in accordance with the approved fire protection program.
- (3) Within 6 months of the date of this GL, submit the plan to return each of the affected structures, systems, and components to compliance with regulatory requirements.

#### **REQUIRED RESPONSE**

In accordance with 10 CFR 50.54(f), an addressee is required to respond as described below so that the NRC can determine whether a facility license should be modified, suspended, or revoked, or whether other action should be taken.

Within 30 days of the date of this GL, an addressee is required to submit a written response if the addressee cannot provide the information or cannot meet the requested completion date. The addressee must address in its response any alternative course of action that it proposes to take, including the basis for the acceptability of the proposed alternative course of action.

GL 2006-XX  
Page 11 of 12

The required written responses should be addressed to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, 11555 Rockville Pike, Rockville, Maryland 20852, under oath or affirmation under the provisions of Section 182a of the Atomic Energy Act of 1954, as amended, and 10 CFR 50.54(f). In addition, a copy of the response should be submitted to the appropriate regional administrator.

#### **REASON FOR INFORMATION REQUEST**

As discussed above, the NRC position has been that all multiple spurious actuations caused by hot shorts have to be considered in a post-fire safe-shutdown circuits analysis. The EPRI/NEI-performed cable fire testing in 2001 demonstrated that multiple spurious actuations can occur with relatively high likelihood and that they can occur simultaneously or in rapid succession without sufficient time for mitigation between actuations. Many licensees' circuits analysis and/or safe-shutdown analysis did not consider this relatively high probability.

The NRC staff will review the responses to this GL and will notify affected addressees if concerns are identified regarding compliance with NRC regulations. The staff may also conduct inspections to determine addressees' effectiveness in addressing the GL.

#### **RELATED GENERIC COMMUNICATIONS**

GL 86-10, "Implementation of Fire Protection Requirements," April 24, 1986

GL 91-18, Rev. 1, "Information to Licensees Regarding NRC Inspection Manual Section on Resolution of Degraded and Nonconforming Conditions," October 8, 1997

IN 92-18, "Potential for Loss of Remote Shutdown Capability During a Control Room Fire," February 28, 1992

IN 99-17, "Problems Associated With Post-Fire Safe-Shutdown Circuit Analyses," June 3, 1999

RIS 2004-03, "Risk-Informed Approach for Post-Fire Safe-Shutdown Associated Circuit Inspections," March 2, 2004

RIS 2004-03, Rev. 1, "Risk-Informed Approach for Post-Fire Safe Shutdown Circuit Inspections," December 29, 2004

RIS 2005-030, "Clarification of Post-Fire Safe-Shutdown Circuit Regulatory Requirements," December 20, 2005

#### **BACKFIT DISCUSSION**

Under the provisions of Section 182a of the Atomic Energy Act of 1954, as amended, 10 CFR 50.109(a)(4)(i), and 10 CFR 50.54(f), this GL requests addressees to evaluate their facilities to confirm compliance with the existing applicable regulatory requirements as

GL 2006-XX  
Page 12 of 12

GL 2006-XX  
Page 13 of 12

discussed in this GL. The NRC position has been that all multiple spurious actuations caused by hot shorts have to be considered in a post-fire safe-shutdown circuits analysis. Also, ~~Specifically,~~ the 2001 EPRI/NEI fire test program demonstrated that the previous assumptions regarding spurious actuations do not adequately address the potential risk to safe shutdown. The EPRI/NEI cable fire tests clearly showed, during and after a fire, a relatively high probability that multiple spurious actuations will occur simultaneously or in rapid succession. Fire-induced hot shorts that cause spurious actuations can prevent a train from performing its post-fire safe-shutdown function. The regulations require that spurious actuations must be considered.

Although both the NRC and the industry have used the phrase "one-at-a-time" in connection with post-fire spurious actuations caused by hot shorts, it is not defined in 10 CFR Part 50 regulations or fire protection guidance documents. The phrase has been used in at least two different senses. Some licensees have used "one-at-a-time" to mean that only one spurious actuation need be postulated for any single fire event. Other licensees have used the phrase to mean that multiple spurious actuations do not occur simultaneously and that there is sufficient time between spurious actuations for operators to take corrective actions. NRC has issued SERs that accepted both interpretations for specific situations in specific plants (e.g., NUREG-0876, Supplement No. 6, "Safety Evaluation Report Related to the Operation of Byron Station, Units 1 and 2," ADAMS Accession No. 8411200507). However, the NRC staff has interpreted the regulations to mean that these interpretations are only allowed with respect to the design of alternate shutdown capability. The EPRI/NEI cable fire testing conducted in 2001 demonstrated that neither interpretation conforms with the likely effects of a fire in an area containing safe-shutdown cables. Accordingly, the NRC staff's positions in this GL with respect to current fire protection requirements do not constitute backfitting as defined in 10 CFR 50.109(a)(1).

However, for Byron Station, Units 1 and 2 and Braidwood Station, Units 1 and 2, the staff positions with respect to one spurious actuation per fire represents a change in staff position, and if applied to the licensees of these plants, would constitute backfits under 10 CFR 50.109(a)(4)(i). As discussed in this GL, the imposition of the position with respect to multiple spurious actuations is necessary to comply with the (unchanged) staff interpretation of 10 CFR 50.48 and 10 CFR Part 50, Appendix A, GDC 3. Staff approval of the "single spurious actuation per fire event" for Byron Station, Units 1 and 2 and Braidwood Station, Units 1 and 2 constituted staff inconsistencies with respect to the necessary prerequisites for demonstrating compliance with 10 CFR 50.48 and 10 CFR Part 50, Appendix A, GDC 3, and the inconsistencies would be rectified by any backfitting imposed by the NRC in accordance with this GL.

The NRC staff has determined, in accordance with 10 CFR 50.54(f), that the information sought in this GL is necessary to verify licensee compliance with existing regulatory requirements in 10 CFR 50.48 and 10 CFR Part 50, Appendix A, GDC 3.

#### **FEDERAL REGISTER NOTIFICATION**

A notice of opportunity for public comment on this GL was published in the *Federal Register* (70 FR 60859) on October 19, 2005. At the request of the industry, a notice that the public

GL 2006-XX  
Page 14 of 12

comment period for this GL was reopened was published in the *Federal Register* (70 FR 76083) on December 22, 2005.

#### **SMALL BUSINESS REGULATORY ENFORCEMENT FAIRNESS ACT**

The NRC has determined that this action is subject to the Small Business Regulatory Enforcement Fairness Act of 1996. The Office of Management and Budget (OMB) has declared the letter not to be a major rule.

#### **PAPERWORK REDUCTION ACT STATEMENT**

This GL contains information collections that are subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). These information collections were approved by OMB clearance no. 3150-0011, which expires on February 28, 2007.

The burden to the public for these ~~mandatory~~ voluntary information collections is estimated to average ~~709~~ 2,460 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments on any aspect of these information collections, including suggestions for reducing the burden, to the Records and FOIA/Privacy Services Branch (T5-F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet electronic mail to [INFOCOLLECTS@NRC.GOV](mailto:INFOCOLLECTS@NRC.GOV); and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0011), Office of Management and Budget, Washington, DC 20503.

#### **Public Protection Notice**

The NRC may not conduct nor sponsor, and a person is not required to respond to, an information collection unless the requesting document displays a currently valid OMB control number.

GL 2006-XX  
Page 15 of 12

## CONTACT

Please direct any questions about this matter to the technical contact or the Lead Project Manager listed below or to the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

Christopher I. Grimes, Director  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

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Note: NRC generic communications may be found on the NRC public Web site, <http://www.nrc.gov>, under Electronic Reading Room/Document Collections.

GL 2005-XX  
Page 12 of 12

## CONTACT

Please direct any questions about this matter to the technical contact or the Lead Project Manager listed below or to the appropriate Office of Nuclear Reactor (NRR) project manager.

Christopher I. Grimes, Director  
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SUBJECT: NRC GENERIC LETTER 2006-XX: POST-FIRE SAFE-SHUTDOWN CIRCUIT ANALYSIS  
SPURIOUS ACTUATIONS

ORIGINATOR: Tony Markley

SECRETARY: Sharon C. Green

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U.S. Nuclear Regulatory Commission (NRC) Staff Resolution of Public Comments on the Draft  
Generic Letter (GL) on Post-Fire Safe-Shutdown Circuit Analysis Spurious Actuations  
(By Category and Bin Number)

**Table 1. Key for Resolution of Comments**

<b>Source of Comments (Adams Accession Number)</b>	<b>Comment Designator</b>	<b>Remarks</b>
Dominion Resources Services, Inc. (ML053630063)	D	Received December 20, 2005
GE Energy (ML053630088)	G	Received December 20, 2005
Engineering Planning and Management, Inc. (EPM) (ML053630092)	P	Received December 20, 2005
Tennessee Valley Authority (TVA) (ML053630094)	T	Received December 21, 2005
Strategic Teaming and Resource Sharing (STARS) (ML053640303)	S	Received December 28, 2005
Entergy Operations, Inc. (ML060110221)	E	Received January 4, 2006
Tennessee Valley Authority (TVA) (ML060410050)	V	Received February 8, 2006
BWR Owners' Group (ML060450053)	B	Received February 9, 2006
Nuclear Energy Institute (NEI) (ML060450056)	N	Received February 9, 2006
Exelon/AmeriGen (ML060450062)	X	Received February 9, 2006

**Table 2. Key to Categories of Comments**

<b>Bin No.</b>	<b>Description</b>
1	Comments on risk-informed circuits analysis
2	Comments on EPRI/NEI test results
3	Comments on circuits analysis
4	Comments on backfit determinations and justification
5	Comments on wording and specific references in the GL text
6	Comments on schedule
7	Miscellaneous comments

## **BIN 1 - COMMENTS ON RISK-INFORMED CIRCUITS ANALYSIS**

### **Comment:**

Dominion Resources Comment D1, STARS Comments S2, S7, S8 - Licensees should be able to use RIS 2004-03, Rev. 1 to meet compliance expectations concerning post-fire safe-shutdown circuit analysis.

### **Staff Response:**

RIS 2004-03 was intended to focus inspectors' limited resources on potential risk-significant items. RIS 2004-03 does not represent a determination on whether or not

regulatory compliance is achieved. The regulations are written to encompass all possible circuits configurations and materials. The proposed GL addresses the regulatory requirements. Plant specific deviations from the regulations based on specific circuit configurations, cable insulation materials, etc., must be addressed via the exemption process.

**Comment:**

STARS Comment S1, TVA comment V9 - The use of risk insights and tools should not be prohibited for plants that have a deterministic-based licensing basis.

**Staff Response:**

Although the NRC is moving toward a more risk-informed approach to plant safety and risk informing inspections of circuit issues, the current regulations do not permit a licensee to use risk-informed methods for circuit analysis without prior staff approval of such methodsexcept as the basis for an exemption request.

**Comment:**

NEI Comment N6, STARS Comment S8 - The industry developed NEI 00-01, Revision 1, "Guidance for Post-Fire Safe- Shutdown Circuit Analysis," to provide utility licensees deterministic and risk-informed methods for resolution of circuit failure issues. We request NRC acknowledgment that NEI 00-01 provides an acceptable approach of deterministic and risk-informed methods.

**Staff Response:**

NRC has already acknowledged that NEI 00-01 provides an acceptable approach of deterministic methods. That acknowledgment is provided in RIS 2005-30 and includes qualifications for applying NEI 00-01 to a deterministic-based fire protection program. The regulatory expectations described in this proposed GL are also applicable to the deterministic application of NEI 00-01. The NRC staff plans wilto acknowledge that NEI 00-01 provides an acceptable approach for a risk-informed licensing basis in the NFPA 805 Regulatory Guide at a later date.

**Comment:**

NEI Comment N7, TVA Comment T9, Exelon/AmeriGen Comment X3 - We believe that a large majority of circuit failure inspection findings will not be risk significant. This has been confirmed by the self assessments that were conducted at three plants using the guidance provided in NEI 04-06.

**Staff Response:**

NRC wants licensees to identify and fix risk-significant circuit issues. Items of little or no risk significance may be submitted as a risk-informed exemption request. The staff recommends that licensees develop a risk screening tool (reviewed and approved by the staff) to focus resources on risk significant configurations.

**BIN 2 - COMMENTS ON EPRI/NEI TEST RESULTS**

**Comment:**

TVA Comments T1 and V1, STARS Comment S4 - The applicability of the EPRI/NEI cable fire test results was questioned for various configurations that are different from those

tested. It was also stated that other factors, such as dual trains, conduit raceways, less than maximum fill in cable trays, and fire science and fire dynamics were not considered in the test.

**Staff Response:**

These factors may be used as the basis of a risk-informed exemption request.

**Comment:**

Entergy Comment E3 - The proposed generic letter uses the EPRI/NEI test data to support the desired position, yet the test data is incomplete as there are several issues that were "binned" as requiring further research. There is no current research on these issues and as such the industry is subject to another series of new interpretations of existing NRC requirements. The proposed generic letter should be a conclusion to several years of debate between the NRC staff and industry on the circuit analysis issue.

**Staff Response:**

The 2001 EPRI/NEI cable functionality fire tests clearly demonstrated that there is a high probability of multiple spurious actuations occurring simultaneously or in rapid succession. It is the staff's opinion that the binned issues that require additional research are referenced would have no effect on whether multiple spurious actuations can occur simultaneously or in rapid succession from a regulatory compliance standpoint. The proposed GL is bringing clarification to the circuits analysis issue. The staff does not plan to revise its position concerning multiple spurious actuations.

**Comment:**

STARS Comments S4 and S5, TVA Comment V12, GE Energy Comment G1, NEI Comment N5, BWR Owners' Group Comment B1 - The EPRI test report referenced in the proposed generic communication indicates that the average time to failure for thermoset cables was 46.3 minutes. The longest and shortest times to spurious actuation for thermoset cable were 85.7 minutes and 14.0 minutes, respectively. There is a reasonable likelihood that appropriate mitigative measures can be taken prior to cable failure.

**Staff Response:**

The regulations do not make allowances for time intervals. The regulations are written to encompass all possible circuits configurations and materials, as well as time intervals between failures. The proposed GL addresses the regulatory requirements. Plant specific deviations from the regulations based on specific circuit configurations, cable insulation materials, etc., must be addressed via the exemption process.

**Comment:**

General Electric Comment G1, BWR Owners' Group Comment B1, Exelon/Amerigen Comment X1 - The FRN states that the EPRI cable fire tests showed a high probability of spurious actuations. Although this is partially true, it is an incomplete assessment of the test results. What is actually true of the tests is that they showed a relatively high probability of spurious actuations given that the cable was actually damaged by fire. Fire damage for those cables most commonly used in the industry (having thermoset insulating material) did not occur until the cable temperature reached very high temperatures. For the tests performed, cable temperatures generally did not reach this level for at least 30 minutes. Additionally, once the

hot shorts did occur, their duration was generally very brief and they ended with a short to ground.

**Staff Response:**

The current regulations for non-NFPA 805 fire protection programs are based on the assumption that all cables in a fire area, unless separated per III.G.1 or III.G.2, are actually damaged by a fire with no allowance for cable insulation materials, automatic reset, etc. Plant specific deviations from the regulatory requirements that rely on fire modeling and risk information may be addressed via the exemption process.

**BIN 3 - COMMENTS ON CIRCUITS ANALYSIS**

**Comment:**

TVA Comments T2 T8, V2, and V8, STARS Comment S5, Exelon/AmeriGen Comment X2 - The NRC staff position on "one-at-a-time" is extremely conservative in light of other defense-in-depth elements in place in a fire protection program.

**Staff Response:**

The regulations are based on ensuring an adequate level of defense in depth. The third element of fire protection defense in depth is to protect structures, systems and components from the effects of fire such that their failure will not prevent the safe shutdown of the plant. The cable fire test program demonstrated that a one-at-a-time approach to circuit analysis does not necessarily address all potential failures that could prevent safe shutdown. The fire protection program must provide protection against these potential failures in order to ensure an adequate level of defense in depth.

**Comment:**

TVA Comments T3, V3, V10, V11, V13, V14, and V15, NEI Comment N4 - The clarification provided for the terms "any-and-all, one-at-a-time" negates some routing configurations previously approved by NRC and implemented by licensees. It further implies that at some point in time, NRC was aware and comfortable with how licensees applied these terms to multiple spurious actuations. These applications were consistent with the deterministic approach to Appendix R. Applying circuit analysis assumptions consistent with NRC recommendations fails to recognize the inherent conservatism in the "any-and-all, one-at-a-time" analyses. These are:

Full area burn-out to  $t=0$

The conservative requirement for 20-foot separation, the basis of which is not supported by fire dynamics; Fire dynamics supports a much lower physical separation

No analysis credit for low combustible loading or ignition source limitations

No credit for actuation of automatic/pre-action sprinkler systems

No credit for intervention of fire brigades

**Staff Response:**

Lack of enforcement or inconsistent enforcement of a regulation does not void that regulation, or constitute NRC approval of noncompliance with that regulation. Nor does lack of enforcement constitute a staff position with respect to a particular interpretation of a regulation. Prior to the 2001 EPRI/NEI cable fire testing, very little information was available regarding circuit failure during a fire, which made enforcement of NRC regulations in that area difficult. However, the 2001 testing program provided valuable information and data that demonstrated and confirmed the importance of these regulatory requirements and interpretations. A licensee may include the above issues in an exemption request. The staff recommends that licensees develop a risk screening tool (reviewed and approved by the staff) to focus resources on risk significant configurations.

**Comment:**

TVA Comment T9 and V9 - Application of the proposed regulatory change does not appear to include provisions for dispositioning issues which are determined to be of little or no-risk significance. Utilization of the proposed GL requirements on a piloted basis identified no applications which were not considered "green" using the NRC significance determination process which by definition is a conservative estimation of risk. Literal compliance with the draft GL requirements through either Appendix R or conversion to a licensing bases, based on NFPA 805, appears to be inconsistent with focusing resources on areas of risk significance.

**Staff Response:**

Items of little or no risk significance may be submitted as a risk-informed exemption request. The staff recommends that licensees develop a risk screening tool (reviewed and approved by the staff) to focus resources on risk significant configurations.

**Comment:**

Entergy Operations Comment E1, STARS Comment S9 - The NRC appears to be prescribing inconsistent safe shutdown criteria with respect to spurious circuit actuations. What is the technical justification for allowing the "any and all one at a time" interpretation for alternative safe shutdown areas (III.G.3) but not for non-alternative safe shutdown areas (III.G.2)? A fire can not tell if the area is an alternative or non-alternative safe shutdown area.

**Staff Response:**

III.G.2 is held to a different standard than III.G.3. III.G.2 protection is the first line of defense in a fire (for plants without III.G.1 protection). III.G.3 protection is a fallback arrangement for protection that does not fully comply with III.G.2 requirements.

**Comment:**

STARS Comment S13 - The general categorization that all circuit analyses that do not consider multiple, spurious actuations, including those that may occur simultaneously or in rapid succession, are inadequate, is not based on demonstrated fact. NEI 00-01 and RIS 2004-03 recognize that circuit analyses are dependent on a number of factors, including cable type. The proposed generic communication should be revised to reflect these additional considerations and to eliminate the broad-based sweeping generalizations of this proposed new regulatory position.

**Staff Response:**

The regulations are written to encompass all possible circuits configurations and materials. The proposed GL addresses the regulatory requirements. Plant specific deviations from the regulations based on specific circuit configurations, cable insulation materials, etc., fire modeling, and risk analysis must be addressed via the exemption process.

#### **BIN 4 - COMMENTS ON BACKFIT DETERMINATIONS AND JUSTIFICATION**

##### **Comment:**

TVA Comments T6 and V6 - The "Backfit Analysis" portion of the draft GL contains technical omissions and general information that is inconsistent with prior NRC documentation. Specifically, the "Backfit Analysis" portion of the GL states, "These assumptions were never included in the regulations or generally adopted by the NRC." This statement is inconsistent with the information contained in the recent draft Regulatory Guide (RG), or NUREG 1778, which provides a clear definition of "any-and-all, one-at-a-time" (refer to Section 2, page 2-3) and provides a clarification of "Criteria/Assumptions" (refer to Section 6.4.6.2, "Circuit Analysis Criteria and Assumptions") which states, ". . . However, the analyst must consider the possibility for each spurious actuation to occur sequentially, as the fire progress, on a one-at-a-time basis." While this is recognized as a draft document, it does appear to provide a historical perspective of this topic. In comparison, the content of this document suggests that those involved in the original development and approval of licensee Fire Protection Programs at numerous facilities may have developed it.

##### **Staff Response:**

If NUREG-1778 is issued as a final document, it will clarify the regulatory requirements as described in the proposed generic letter. With respect to the required level of circuit protection from fire induced failures, a sequential one-at-a-time approach to post-fire circuit analysis without a specified time between spurious actuations is essentially the same as a simultaneous multiple spurious actuations approach. Unless the licensee can adequately demonstrate that sufficient time is available to take mitigating action between each sequential actuation (and that the mitigating action is feasible and reliable), the same level of protection must be provided. Draft NUREG-1778, as well as the regulations, does not address the expected time between actuations since this time will be unique for each situation.

Some licensees may have interpreted the reference to one-at-a-time in NUREG-1778 to mean that the circuit analysis can assume that there will be sufficient time between spurious actuations to take mitigating actions. That interpretation is incorrect and the cable fire test program demonstrated that such an assumption cannot be shown to be invalid.

##### **Comment:**

TVA Comments T7 and V7 - Additionally, the "Backfit Analysis" discussion and other portions of the draft GL fail to include such technical issues as fire dynamics/growth, actuation of suppression systems, and separation of trained circuits. (i.e., most safety-related trained circuits have been separated in accordance with RG 1.75, and both trains must fail simultaneously to cause a problem.)

##### **Staff Response:**

Technical issues such as fire dynamics/growth and suppression system actuation are

relevant to a risk-informed approach to fire protection and may only be used as the basis for an exemption request for non-NFPA 805 plants. Regulatory Guide 1.75 states that "Post-fire safe-shutdown capability is distinctly different from, and credits operability of different equipment than the safety-related equipment required for emergency shutdown of a nuclear power plant. Regulatory Guide 1.189, "Fire Protection for Operating Nuclear Power Plants," provides additional guidance concerning the fire protection area. Regulatory Guide 1.189, Paragraph 5.5 b states "Separation of cables and equipment and associated non-safety circuits of redundant success paths by a horizontal distance of more than 6.1 m (20 feet) with no intervening combustible or fire hazards."

**Comment:**

STARS Comment S6 - NRC Management Directive 8.4, "Management of Facility-Specific Backfitting and Information Collection," states the following objective regarding backfits:

"To ensure that NRC-licensed facilities provide adequate protection of the public health and safety and common defense and security, and allow for substantial improvements in either safety or security, beyond adequate protection, while avoiding any unwarranted burden on NRC, the public, or licensees when implementing such backfits."

The backfit discussion does not meet this objective in that it does not demonstrate a substantial improvement in safety or security beyond adequate protection. In addition, it does not recognize the potential burden, particularly on the NRC and licensees, of the proposed generic communication and the new staff position being imposed therein. The proposed generic communication may result in substantial re-analyses of a licensee's established fire protection program, require extensive modifications to the facility, and may result in a significant number of exemption or license amendments requests (including requests to adopt 10 CFR 50.48(c)), all to address risk-insignificant issues where adequate protection of the public health and safety already exists.

**Staff Response:**

The proposed GL does not backfit any plants. Its purpose is to share information with the licensees and request that licensee confirm whether they continue to be in compliance with the fire protection regulations. The staff has performed a regulatory analysis and determined that the GL provides the best avenue to establish that licensees are in regulatory compliance with respect to the multiple spurious actuations. The staff realizes that the proposed GL will place a burden on licensees and the staff, but the staff believes it is a necessary burden to protect public health and safety. 10 CFR 50.109 (4)(ii) states "That regulatory action is necessary to ensure that the facility provides adequate protection to the health and safety of the public and is in accord with the common defense and security..." 10 CFR 50.109(5) states "The Commission shall always require the backfitting of a facility if it determines that such regulatory action is necessary to ensure that the facility provides adequate protection to the health and safety of the public and is in accord with the common defense and security." NRC wrote this GL to ensure that NPPs provide adequate protection to the health and safety of the public, based on the results of the 2001 EPRI/NEI cable fire tests. We are compelled to require a compliance backfit if multiple spurious actuations that have not been accounted for in the circuits analyses could prevent safe shutdown of the plant .

**Comment:**

NEI Comment N3 - In effect, the NRC is using a generic communication to change the plant licensing basis. The NRC has determined that the information requested is a compliance exception in accordance with the provisions of 10 CFR 50.109(a)(4)(i). The NRC has not provided a documented evaluation that is required by this regulation.

**Staff Response:**

NRC is using this generic communication to inform licensees that they may not be in compliance with the regulations. 10CFR 50.109(a)(4) states "The provisions of paragraphs (a)(2) and (a)(3) of this section are inapplicable and, therefore, backfit analysis is not required...where the Commission or staff, as appropriate, finds and declares, with appropriated document evaluation for its finding, either: (i) That a modification is necessary to bring a facility into compliance with a license or the rules or orders of the Commission..." Therefore, a backfit analysis is not required. However, the staff has performed a regulatory analysis and determined that the proposed GL provides the best avenue to establish that licensees are in regulatory compliance with respect to the multiple spurious actuations.

**BIN 5 - COMMENTS ON WORDING AND SPECIFIC REFERENCES IN THE GL****Comment:**

TVA Comments T4 and V4 - The proposed GL stated, "The staff found no documented evidence that it has taken positions inconsistent with this GL." This statement is inaccurate. The proposed regulatory "clarifications" conflicts with past NRC positions and/or interpretations documented in some SERs, other NRC documents, and public proceedings. The proposed GL further seems to be inconsistent with the "discussion" portion of the proposed GL which appears to acknowledge that plants have been licensed using multiple interpretations of "any-and-all, one-at-a-time." Issuing regulatory interpretations or guidance contrary to existing documentation potentially results in liabilities to the utility and the NRC.

**Staff Response:**

The proposed GL does not contain the phrase "The staff found no documented evidence that it has taken positions inconsistent with this GL." The proposed GL acknowledges that SERs have been issued that allowed circuit analysis assumptions that are not consistent with this proposed GL. Industry testing has demonstrated that those assumptions are not valid.

**Comment:**

STARS Comment S16 - "Requested Actions" - The second sentence of Item (1) does not provide relevant information. STARS recommends deleting this sentence and replacing it with a sentence that provides specific guidance, similar to that provided in NEI 00-01, for performing these assessments.

**Staff Response:**

NRC staff agrees with this comment. The sentence can be deleted. The first sentence of Item (1) provides guidance for the assessment required.

**Comment:**

STARS Comment S17 - "Backfit Discussion," paragraph beginning with "The 2001 EPRI/NEI fire test program," third sentence - this sentence includes the phrase "and with

licensees' licensing basis." This phrase, when taken in the context of this statement may be inaccurate. As stated in the proposed generic communication, a licensee's existing licensing basis may allow for a single spurious actuation, or multiple, spurious actuations taken one-at-a-time, for certain analyses, which may, or may not be, interpreted to pertain only to alternate shutdown capability (see Comment 12). In addition, the regulatory position stated in the proposed generic communication could represent a new compliance strategy for most plants. Therefore, their existing licensing basis may not consider multiple, spurious actuations, or multiple, spurious actuations that occur simultaneously or in rapid succession. This phrase should be deleted from this sentence.

**Staff Response:**

NRC staff agrees with this comment. The phrase will be revised to read "and with licensees' licensing bases (if applicable)..."

**Comment:**

STARS Comment S18 - "Applicable Regulatory Guidance" - this section refers to Draft Regulatory Guide DG-1139, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear power Plants," as being an acceptable method for performing evaluations. It is inappropriate to reference a draft document that is subject to change prior to receiving final NRC approval. This reference should be modified to state that the techniques described in this document may be used when final approval is received, or include a provision that acknowledges the risk that the document is subject to change, and that licensees who choose to use this information do so at their own risk.

**Staff Response:**

NRC staff agrees with this comment. The proposed GL will be revised accordingly.

**Comment:**

STARS Comment S19 - "Requested Information," Item (2)(a) - The reference to Generic Letter 91-18, Revision 1, is incorrect. GL 91-18 has been superseded in its entirety by Regulatory Issue Summary 2005-20, Revision to Guidance Formerly Contained In NRC Generic Letter 91-18, "Information to Licensees regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability," dated September 26, 2005.

**Staff Response:**

NRC staff agrees with this comment. The proposed GL will be revised accordingly.

**Comment:**

STARS Comment S20 - The references to "10 CFR Part 50, General Design Criterion (GDC) 3" are not complete. STARS suggest providing the complete reference to this criterion on the first instance (10 CFR Part 50, Appendix A, General Design Criterion 3), and correcting all subsequent references to "10 CFR 50, App. A, GDC 3."

**Staff Response:**

NRC staff agrees with this comment. The proposed GL will be revised accordingly.

**Comment:**

STARS Comment S21 - The references to "10 CFR 50.109(a)(4)(I)" appear to be incorrect. The correct reference should be "10 CFR 50.109(a)(4)(i)."

**Staff Response:**

NRC staff agrees with this comment. The proposed GL will be revised accordingly.

**Comment:**

TVA Comments T5 and V5 - NRC's suggestion that a licensee's conversion to National Fire Protection Association (NFPA) 805 regulations is a relatively straightforward and inexpensive process is inaccurate. The process will most likely take three or more years at a cost that exceeds five million dollars, while exposing licensees to unknown regulatory uncertainties. For example, the development of a regular plant probabilistic risk analysis relies heavily on engineering judgement that could lead to differing professional opinions and significant cost and schedule ramifications. Similar uncertainties exist when considering fire modeling. There appears to be no single standard that contains modeling conservatisms acceptable to licensees and the NRC. Resolution of these type issues could result in significant expenditures of resources.

**Staff Response:**

The proposed GL does not suggest that a licensee's conversion to NFPA 805 is a relatively straightforward and inexpensive process.

**Comment:**

STARS Comment S11 - The statements "multiple spurious actuation(s)" and "multiple spurious actuations that occur simultaneously or in rapid succession" appear to be used interchangeably throughout this document. Clarification should be provided to clearly distinguish between the two phrases, since each phrase has a very specific meaning that differs greatly for how these phrases are to be treated in the post-fire safe shutdown circuit analyses.

**Response:**

RIS 2005-30 addresses regulatory expectations with respect to multiple spurious actuations. This proposed GL addresses regulatory expectations with respect to the assumptions for the timing of those actuations. Both phrases apply to circuit analyses for fire areas where more than one spurious actuation could prevent safe shutdown.

**Comment:**

Entergy Operations Comment E2 - This proposed document, as well as other recent documents on the issue, states that "All plants must review their circuits analysis, assuming possible multiple spurious actuations occurring simultaneously from a fire." The "requirement" as proposed is that you must consider all multiple spurious actuations occurring simultaneously. The complete application of this requirement is recognized by the NRC and industry as not feasible/reasonable; NRC has provided informal guidance (such as consider the worst 2 or 3 simultaneous spurious actuations) to clarify the intent of the requirement. This appears to be inconsistent guidance proposed by the regulator that will be an open and unclear issue for debate during NRC inspections. The generic letter should provide a clear and reasonable requirement.

**Staff Response:**

The 2001 EPRI/NEI cable functionality fire tests clearly demonstrated that there is a high probability of multiple spurious actuations occurring simultaneously or in rapid succession. The current regulations do not provide a limit on the number of spurious actuations to consider. If a licensee does not want to consider all spurious actuations in their circuits analyses, they can use the fire modeling or probabilistic bases in support of an exemption. submit a risk-informed amendment request, or they can transition to NFPA 805.

**Comment:**

EPM Comment P1 - The proposed GL in part states:

The deterministic methodology in NEI 00-01, Rev. 1 (January 2005), "Guidance for Post-Fire Safe Shutdown circuit analysis," chapter 3, for analysis of post-fire safe-shutdown circuits, in conjunction with the guidance provided in this GL, is one acceptable approach to achieving regulatory compliance with post-fire safe shutdown circuit protection requirements for multiple spurious actuations. Licensees should assume that the fire may affect all unprotected cables and equipment within the fire area and address all cables and equipment impacts affecting the required safe shutdown path in the fire area. All potential impacts within the fire area must be addressed".

Section 3.5.1.5(C) of NEI 00-01 states:

"For cases involving the potential damage of more than one multiconductor cable, a maximum of two cables should be assumed to be damaged concurrently. The spurious actuations should be evaluated as previously described. The consideration of more than two cables being damaged (and subsequent spurious actuations) is deferred pending additional research".

These statements are in conflict with each other. It appears that NEI 00-01 is limiting the spurious actuations resulting from only two cables, similar to RIS-2004-003. However, the GL states that fire may impact all unprotected cables. Please provide clarification for this issue.

**Staff Response:**

The key wording in the proposed GL is "in conjunction with the guidance provided in this GL." This means that the deterministic methodology in NEI 00-01 may be used, but the information requests requirements included in this proposed GL must be addressed (i.e., all unprotected cables in a fire area are affected by a fire).

RIS 2004-03 was intended to focus inspectors' limited resources on potential risk-significant items. RIS 2004-03 does not represent a determination on whether or not regulatory compliance is achieved. The regulations are written to encompass all possible circuits configurations and materials. The proposed GL addresses the regulatory requirements.

**Comment:**

STARS Comment S12 - The fifth sentence of the first paragraph of the "Discussion" section states that "However, current NRC regulations only allow these interpretations with respect to the design of alternate shutdown capability." In STARS opinion, the NRC interpretation that this statement applies only to alternate shutdown capability may be incorrect,

and licensees may have a differing view. Each safety evaluation report must be reviewed to determine how these interpretations were applied to each plant.

Regardless of how the interpretation is applied, this paragraph continues on to state "Therefore, these interpretations do not ensure safe shutdown." This is a broad, all-encompassing statement that is made based on specific, limited fire test results. This statement does not take into consideration the specific analyses that were performed, nor does it account for actual plant configurations and fire detection and suppression design features. To simply state that safe shutdown is not ensured due to the consideration of one assumption is misleading at best. This statement should be deleted in its entirety, or be revised to reflect that a licensee's existing analyses may not be sufficient to demonstrate that safe shutdown is ensured.

**Response:**

The sixth paragraph of the "Discussion" section of the proposed GL states that one basis for the industry's position on the phrase "one-at-a-time" is the Response to Question 5.3.10 in GL 86-10. This response states that "the safe shutdown capability should not be adversely affected by any one spurious actuation or signal resulting from a fire in any plant area." However, this response applies only to Appendix R, Section III.L, "Alternate and Dedicated Shutdown Capability." If a failure mechanism that could prevent safe shutdown has not been addressed in the post-fire safe-shutdown circuit analysis, then the analysis does not ensure safe shutdown. The specific analyses that were performed, the plant configurations, and the fire detection and suppression design features may be used as the basis for a risk-informed exemption request.

**Comment:**

STARS Comment S14 - The fifth paragraph of the "Discussion" section includes the statement "All plants must review their circuit analysis, assuming possible multiple spurious actuations occurring simultaneously from a fire." No further guidance is provided on how this expectation is to be met.

**Response:**

Guidance on how this expectation is to be met is provided in the "Applicable Regulatory Guidance" section of the proposed GL. In this section it is stated that "The deterministic methodology in NEI 00-01, Rev. 1 (January 2005), "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Chapter 3, for analysis of post-fire safe-shutdown circuits, in conjunction with the guidance provided in this GL, is one acceptable approach to achieving regulatory compliance with post-fire safe-shutdown circuit protection requirements for multiple spurious actuations." Licensees may also submit an exemption request based on risk-informed analysis methods.

**Comment:**

STARS Comment S15 - "Methods of Compliance" - this section implies that the risk-informed approach guidance provided in Regulatory Guide 1.174 is an acceptable method for providing the basis of an exemption request. The second bullet states that plants licensed after January 01, 1979 can not use a risk-informed approach without applying for a license amendment. This treatment of risk insights is inconsistent, with the sole determining factor appearing to be dependent on who has right-of-approval. The NRC recognizes RG 1.174 as an approach that provides acceptable methods. The standard license condition delegates certain

aspects of right-of-approval to the licensee, provided that certain conditions are met. Therefore, licensees with the standard license condition should be able to review and accept changes using the same methods that are acceptable to the NRC staff for other licensing actions, provided that the ability to achieve and maintain safe shutdown is not adversely affected.

**Staff Response:**

As stated in the second bullet of the referenced section of the proposed GL, Plants licensed after January 1, 1979, that use a risk-informed approach must submit a license amendment in accordance with 10 CFR 50.90. The exception to 10 CFR 50.90, provided in the standard license condition and in 10 CFR 50.48(f)(3), does not apply because the risk assessment approaches used by plants deviate from the approved deterministic approaches used in their licensing basis. Furthermore, the licensees' risk assessment tools have not been reviewed or inspected against quality standards found acceptable to the NRC staff." The guidance and acceptable risk thresholds provided in RG 1.174 are predicated on the licensee submitting a license amendment for NRC review and approval.

**Comment:**

BWR Owners' Group Comment B4 - The last paragraph on page for of the GL states that the "industry had long claimed that spurious actuations were not credible." These tests would not have been conducted if the industry actually believed that fire-induced spurious actuations were not credible.

**Staff Response:**

The referenced statement is a simplification of the industry position based on discussions with NRC staff members that have been involved in this issue for many years. However, since the deletion of this statement will have no impact on the proposed GL, rather than debate the accuracy of the statement, it will be deleted.

**BIN 6 - COMMENTS ON SCHEDULE**

**Comment:**

STARS Comment S10 - "Requested Actions" and "Requested Information" - the 90-day time period for the responses is arbitrary, and it may not allow sufficient time for licensees who may be affected by this issue to adequately respond and provide the requested information. Depending on the extent of condition and the proposed corrective action(s), it may take a licensee a significant amount of engineering and support resources to perform the operability determinations, take appropriate compensatory measures, and to design, schedule, and implement the corrective action solution(s), and/or apply for a license amendment or exemption. STARS recommends extending the response period for Requested Actions (2) and (3), and Requested Information (2), including all sub-parts, to a mutually agreeable time frame so that an adequate and complete response may be developed by the licensee.

The NRC staff should work with the industry during the public comment resolution process to develop a response time period that balances the safety significance and risk of the issue with providing licensees with sufficient time to provide a complete and adequate response.

**Response:**

The proposed GL has been revised to read, "within 6 months of the date of this letter, determine plans for plant modifications, license amendments, exemption requests, or other means, to meet regulatory requirements and the plant's licensing basis." Also, in the "Required Response" section of the proposed GL, it is stated that "Within 30 days of the date of this GL, an addressee is required to submit a written response if it is unable to provide the information or it cannot meet the requested completion date. The addressee must address in its response any alternative course of action that it proposes to take, including the basis for the acceptability of the proposed alternative course of action."

**BIN 7 - MISCELLANEOUS COMMENTS****Comment:**

GE Energy Comment G2, BWR Owners' Group Comment B2 - NRC discounts the industry position on "one-at-a-time," as stated in an NEI letter of May 30, 1997, based on a position stated in a 1982 NRC letter from Dennis Crutchfield to P.B. Fiedler. First, an NRC letter to a licensee is not an appropriate mechanism for conveying a staff position of generic applicability. Second, this justification was not made widely known until the publication of the current FRN (70 FR 60859).

In addition, the NRC states that the May 30, 1997, NEI letter offered no assessment of the safety significance of multiple sequential and cumulative failures to support its contention that such failures were low significance. This is true, but pilot PRA studies performed later did demonstrate that such failures were of low significance, as noted above.

**Staff Response:**

The NRC discounts the industry position on one-at-a-time based on the regulatory requirements of Appendix R and GL 86-10 and on the results of the cable fire test program. The April 30, 1982 NRC letter from Dennis Crutchfield to P.B. Fiedler is referenced in the proposed GL to provide additional insight into the basis for the staff positions stated in Appendix R and GL 86-10. NRC has observed the results of at least one pilot PRA study.

**Comment:**

BWR Owners' Group Comment B3 - The fact is ignored that licensees have been complying (as measured by licensing submittals and inspections) with their licensing bases for many years prior to the emergence of fire-induced circuit failures as an issue in 1996.....Arguments that plants can resolve circuit failure issues through adopting NFPA 805 ignore the fact that transition to a new methodology will take significant time and require extensive use of limited resources.....Arguments that plants not adopting NFPA 805 can submit risk-informed exemption requests ignore the unnecessary burden this will place on NRC staff and industry alike. Numerous exemption requests for multiple circuit failures would have to be submitted by each plant in order to come into compliance.....

**Staff Response:**

Inspections do not establish regulatory requirements. As noted above, the staff recognizes the significant cost and time required to adopt NFPA 805. The staff also recognizes

the potential impact of preparing and reviewing many exemptions requests. The staff recommends that licensees develop a risk screening tool (reviewed and approved by the staff) to focus resources on risk significant configurations, and interpretations NRC staff acknowledges that adopting NFPA 805 will take significant time and require extensive use of limited resources. Plants that do not adopt NFPA 805 must follow the regulations and submit exemption request for multiple circuit failures.

1

**APPENDIX C TO THE  
COMMITTEE TO REVIEW GENERIC REQUIREMENTS (CRGR) CHARTER**

**PROPOSED ACTION:** The U.S. Nuclear Regulatory Commission (NRC) is issuing this generic letter (GL) to obtain information in the following four areas:

1. Addressees' description of their licensing basis regarding multiple spurious post-fire safe-shutdown circuit analyses. Specifically, the plant licensing basis compared to the regulatory requirement for protecting of redundant safe-shutdown trains from multiple simultaneous spurious actuations and maintaining one train free of fire damage.
  2. Status of compliance in light of the NRC position that multiple spurious actuations caused by hot shorts must be considered and evaluated per 10 CFR 50.48 and 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 3, and recent Electric Power Research Institute (EPRI)/Nuclear Energy Institute (NEI) cable fire tests results which demonstrated that the assumption of only a single spurious actuation per fire event or that spurious actuations will occur with sufficient time between them to take corrective actions ("one-at-a-time") is not valid.
  3. Compensatory measures in place for those addressees affected
  4. Corrective actions and implementation schedule for those addressees affected
- (i) **The proposed generic requirement or staff position as it is proposed to be sent out to licensees.**

All addressees are requested to provide the following information:

- (1) Within 90 days of the date of the generic letter submit their licensing basis that describes their licensing basis regarding multiple spurious post-fire safe-shutdown circuit analyses. Specifically, the plant licensing basis compared to the regulatory requirement for protecting of redundant safe-shutdown trains from multiple simultaneous spurious actuations and maintaining one train free of fire damage.
- (2) Submit a conclusion based on the plant licensing basis and the information provided in the generic letter, stating as to whether the NPP is in compliance with regulatory requirements.
  - a. For plants that conclude they are not in compliance with regulatory requirements, submit an assessment of the functionality of affected structures, systems, and components that addresses the ability to achieve and maintain safe shutdown in light of multiple spurious hot shorts as a result of a fire. An acceptable assessment would be consistent with an evaluation performed for RIS 2005-20. ~~and~~
  - b. For plants that conclude they are not in compliance with regulatory requirements,

ATTACHMENT 2

2

submit a description of the compensatory measures in place to maintain the safe shutdown function of affected areas of the plant in accordance with the approved fire protection program.

- (3) Within 6 months of the date of the generic letter, provide a response concerning the plans for each of the affected structures, systems, and components to return to compliance with regulatory requirements.

- (ii) **Draft papers or other underlying staff documents supporting the requirements or staff positions. (A copy of all materials referenced in the document shall be made available upon request to the CRGR staff. Any Committee member may request CRGR staff to obtain a copy of any reference material for his or her use.)**

1. Generic Letter 86-10, "Implementation of Fire Protection Requirements," April 24, 1986
2. Regulatory Issue Summary 2005-20, "Revision to Guidance Formerly Contained in NRC Generic Letter 91-18, "Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability"" September 26, 2005
3. Information Notice 92-18, "Potential for Loss of Remote Shutdown Capability During a Control Room Fire," February 28, 1992
4. Regulatory Issue Summary 2004-03, "Risk-Informed Approach for Post-Fire Safe-Shutdown Associated Circuit Inspections," March 2, 2004
5. Regulatory Issue Summary 2004-03 Rev. 1, "Risk-Informed Approach for Post-Fire Safe Shutdown Circuit Inspections," December 29, 2004
6. Regulatory Issue Summary 2005-30, "Clarification of Post-Fire Safe-Shutdown Circuit Regulatory Requirements," December 20, 2005
7. Draft Generic Letter 20056-XX, "Post-Fire Safe-Shutdown Circuit Analysis Spurious Actuations," December 22, 2005

- (iii) **Each proposed requirement or staff position shall contain the sponsoring office's position as to whether the proposal would modify requirements or staff positions, implement existing requirements or staff positions, or would relax or reduce existing requirements or staff positions.**

This GL transmits a requirement to respond to an information request pursuant to Section 182.a of the Atomic Energy Act of 1954, as amended, and 10 CFR 50.54(f) for the purpose of verifying compliance with applicable regulatory requirements. Specifically, The NRC has had a position that multiple spurious actuations must be considered and evaluated, per 10 CFR 50.48 and 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 3. This position was confirmed by the results of the Electric Power Research Institute (EPRI)/Nuclear Energy Institute (NEI) cable fire tests, which the results from the EPRI/NEI cable fire tests showed a

3

relatively high probability of multiple spurious actuations occurring simultaneously or in rapid succession during or after a fire. Some licensees have assumed only a single spurious actuation, and others have assumed that multiple spurious actuations can only occur "one-at-a-time," with sufficient delay between actuations to allow for mitigation. If multiple spurious actuations occurring simultaneously or in rapid succession during or after a fire have not been considered by licensees in their post-fire safe-shutdown circuit analysis, it is possible that they are not in compliance with 10 CFR 50.48 and 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 3. The GL does not increase requirements or staff positions or implement existing requirements or staff positions, nor does it relax or reduce the existing requirements or staff positions.

- (iv) The proposed method of implementation and resource implications, along with the concurrence (and any comments) of OGC on the method proposed, the concurrence of affected program offices or an explanation of any non-concurrences.**

The proposed method of implementation is to develop and issue the GL. The Office of General Counsel has no legal objections to the GL. All affected program offices have concurred on the proposed GL. The resources required for the Office of Nuclear Reactor Regulation (NRR) technical review of the GL responses have been budgeted. The NRR Division of Risk Assessment resources for reviewing the GL responses, approximately 5.4 full-time equivalent (FTE) over two years, will be covered by PA Code 111-122CB.

- (v) Regulatory analyses conforming to the directives and guidance of NUREG/GR-0058 and NUREG/BR-0184, as applicable. (This does not apply for backfits that ensure compliance or ensure, define, or redefine adequate protection. For power reactors, a documented evaluation is required as discussed under item [ix] of this Appendix.)**

Not applicable. This GL ensures compliance with the current regulations.

- (vi) Identification of the category of reactor plants to which the generic requirement or staff position is to apply (that is, whether it is applicable to future plants, operating plants, all pressurized water reactors [PWRs], all boiling water reactors [BWRs], specific nuclear steam supply system [NSSS] vendor types, specific vintage type plants, gaseous diffusion plants [GDPs], etc.).**

The GL applies to all holders of operating licenses for light-water nuclear power reactors, except licensees who have ceased operations and certified that fuel has been permanently removed from the reactor vessel.

- (vii) For proposed backfits, other than either the compliance or the adequate protection backfits, a backfit analysis as defined in the Backfit Rule should be performed.**

Not applicable. This GL invokes a compliance exception and is proposed for the purpose of verifying compliance with the current regulations.

- (viii) For each proposed backfit analyzed pursuant to 10 CFR 50.109(a)(2)**

4

(i.e., not adequate protection backfits and not compliance backfits), the proposing Office Director's determination, together with the rationale for the determination based on the consideration of paragraph (i) and (vii) above, that:

- (a) There is a substantial increase in the overall protection of public health and safety or the common defense and security will be derived from the proposal; and
- (b) The direct and indirect costs of implementation, for the facilities affected, are justified in view of this increased protection.

Not applicable. This GL is a compliance exception and is proposed for the purpose of verifying compliance with the current regulations.

(ix) For adequate protection or compliance backfits affecting power reactors, evaluated pursuant to 10 CFR 50.109(a)(4) (or analogous provisions in 10 CFR 72.62 or 10 CFR 76.76, as appropriate),

- (a) A documented evaluation consisting of:
  - (1) the objectives of the modification

No modification is requested in the GL. Information is requested to verify compliance with existing applicable fire protection regulatory requirements. Affected licensees are asked to resolve any noncompliances in light of the NRC's position that multiple spurious actuations must be considered and evaluated per 10 CFR 50.48 and 10 CFR Part 50, Appendix A, GDC 3, and new information identified, and to put compensatory measures in place until corrective actions are implemented.

- (2) the reasons for the modification

This GL does not propose any modification. However, information and actions, if warranted, are requested because new information has come to light regarding multiple spurious actuations in circuits analyses. Specifically, The NRC has had a position that multiple spurious actuations must be considered and evaluated, per 10 CFR 50.48 and 10 CFR Part 50, Appendix A, GDC 3. This position was confirmed by the results of the Electric Power Research Institute (EPRI)/Nuclear Energy Institute (NEI) cable fire tests, which EPRI/NEI performed cable fire tests that showed a relatively high probability of multiple spurious actuations occurring simultaneously or in rapid succession during or after a fire. Based on these test results, the staff is concerned that licensees who did not include multiple spurious actuations in their circuits analyses may not be in compliance with NRC regulations.

- (3) if the compliance exception is invoked,

- (A) the requirements (e.g., Commission regulation,

**license condition, order) or written licensee commitments, for which compliance is sought.**

Not applicable. This GL is proposed for the purpose of verifying compliance with the current regulations.

- (B) an assessment of risk/safety implications of not requiring licensees to immediately restore compliance, and the basis for determination that a reasonable concession could be allowed to defer restoration of compliance at a later time (e.g., next refueling outage).**

The EPRI/NEI cable fire tests showed a relatively high probability of multiple spurious actuations occurring simultaneously or in rapid succession during or after a fire. If a licensee did not consider multiple spurious actuations in their post-fire safe-shutdown circuit analysis, it is possible that reasonable assurance cannot be provided that one train of systems necessary to achieve and maintain safe shutdown is free of fire damage. However, the protection of cables from fire damage by separation is one level of the defense-in-depth (DID) concept. The other levels (fire detection, fire suppression, administrative controls) are not affected by multiple spurious actuations.

A bounding analysis on the potential fire risk in terms of core damage frequency (ADAMS Accession No. ML060830212) indicates that despite some likely conservative assumptions, multiple spurious actuations caused by hot shorts can be risk significant.

As such, the NRC does not foresee a large number of high risk-significant situations that require expedited regulation, especially since licensees are required to take immediate compensatory actions.

- (C) demonstrated consideration of other possible alternatives and rationale for rejecting them in favor of compliance backfitting.**

The NRC staff, beginning in 1997, noticed that a series of licensee event reports (LERs) identified plant-specific problems related to potential fire-induced electrical failures that could prevent operation, or cause maloperation, of equipment necessary to achieve and maintain hot shutdown. These problems were documented in Information Notice 99-17, "Problems Associated With Post-Fire Safe-Shutdown Circuit Analysis." In 1998 the NRC staff started to interact with interested stakeholders in an attempt to understand the problem and develop an effective risk-informed solution to the circuit analysis issue. NRC also issued Enforcement Guidance Memorandum (EGM) 98-002, Rev. 2, to provide a process for treating inspection findings while the issues were being clarified. Due to the number of different stakeholder interpretations

of the regulations, the NRC decided to temporarily suspend the associated circuit part of fire protection inspections. In 2001 EPRI and NEI did a series of cable functionality fire tests to further the nuclear industry's understanding of fire-induced failures, particularly spurious equipment actuations initiated by hot shorts. Based on the test results, the NRC staff and NEI concluded that the probability of fire-induced circuit failures can be relatively high and that there can be a relatively high probability of multiple spurious actuations occurring simultaneously or in rapid succession. Therefore, the staff is proposing issuance of this GL for assurance that licensees' circuits analyses are in compliance with 10 CFR 50.48 and 10 CFR Part 50, Appendix A, GDC 3.

**(D) evaluation from cost-benefit considerations (not a full-blown regulatory analysis) and a rationale for compliance exception.**

This GL does not impose a backfit. However, because a compliance backfit may be required for some licensees in the future, the following cost-benefit information is provided.

Section 4.4 of the "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," NUREG/BR-0058, Rev. 4, states:

"For certain regulatory actions, the regulatory analysis may consist of only a cost-effectiveness analysis. For example, the NRC may be required to initiate a requirement and achieve a certain level of value based on court or Congressional mandates, or the NRC may require compliance or adequate protection actions. Under these circumstances, the issue is not to determine whether the impacts of the new requirement are justified, but rather to ensure that the requirement achieves the necessary level of value in an efficient and cost-effective manner given the other implementing mechanisms available. Similarly, there may be proposed actions with important values that cannot be assigned monetary values or with uncertainties that are substantial. If the alternatives yield similar values, cost-effectiveness analysis can be used to choose the most efficient alternative."

This GL gives licensees the option of choosing the means of complying with existing requirements. Licensees will in effect be determining which option is most cost-effective for their situation.

However, the cost-benefit considerations are identified in the responses to item x, Parts a and b, below. The 2001 EPRI/NEI cable fire tests showed a relatively high probability of multiple spurious actuations occurring simultaneously or in rapid succession during or after a fire. NRC is concerned that there may be plants which are noncompliant with 10 CFR 50.48. The response to item x, Part b estimates a total industry cost of approximately \$6,448,000 to respond to this GL. The staff

7

believes the cost is worth the benefit of the nuclear power plant compliance with 10 CFR 50.48, which assures that plants are able to safely shut down in the event of fire.

Regarding the compliance exception rationale, because this GL transmits a requirement to respond to an information request pursuant to Section 182.a of the Atomic Energy Act of 1954, as amended, and 10 CFR 50.54(f), for the purpose of verifying compliance with applicable regulatory requirements; it is the staff position that the proposed GL does not increase requirements or staff positions or implement existing requirements or staff positions, nor does it relax or reduce the existing requirements or staff positions. Therefore, it is a compliance exception, proposed for the purpose of verifying compliance with licensees' existing licensing basis.

- (4) If the adequate protection exception is invoked, the basis for concluding that the matter to be addressed involves adequate protection, and why current requirements (e.g., Commission regulation, license condition, order) or written licensee commitments do not provide adequate protection.**

Not applicable. The GL does not apply the adequate protection exception.

- (b) In addition, for actions that were immediately effective (and therefore issued without prior CRGR review as discussed in Section III of the CRGR Charter), the evaluation shall document the safety significance and appropriateness of the action taken and (if applicable) consideration of how costs contributed to selecting the solution among various acceptable alternatives.**

Not applicable. The GL request does not include a request for immediate actions and therefore will be reviewed by the CRGR before issuance.

- (x) For each request for information from power reactor licensees under 10 CFR 50.54(f), which is for purposes other than to verify compliance with the facility's licensing basis, an evaluation that includes at least the following elements:**

Although the GL is proposed for the purpose of verifying licensees' compliance with the regulations, the staff has provided a "simplified value-impact analysis" in responses to Parts a through e below, in accordance with NRR Office Instruction LIC-503, Revision 2, "Generic Communications Affecting Nuclear Reactor Licensees," and SECY-99-143, "Revisions to the Generic Communications Program."

- (a) A problem statement that describes the need for the information in terms of potential safety benefit.**

The information requested in this GL is needed because multiple spurious actuations

during or after a fire could prevent the operation, or cause maloperation, of equipment necessary to achieve and maintain post-fire safe-shutdown. It has been the NRC's position that multiple spurious actuations must be considered in the circuits analyses. The 2001 EPRI/NEI cable fire tests showed a relatively high probability of multiple spurious actuations occurring simultaneously or in rapid succession during or after a fire.

**(b) The licensee actions required and the cost to develop a response to the information request.**

The GL would require responses from all 103 operating power reactors and Browns Ferry Unit 1. The recipients would be required to notify the NRC whether or not they conclude that they are in compliance with the applicable regulatory requirements regarding their assumptions of the phrase "one-at-a-time" in light of the information provided in the GL. Recipients who conclude that they continue to be in compliance with the regulatory requirements need to state the basis for their conclusion. We estimate that each licensee would take approximately 80 staff-hours to review their existing circuits analysis. At an assumed hourly rate of \$100 per staff hour, this totals to \$8000 per reactor unit or about \$832,000 for the industry.

We estimate that 36 recipients would take approximately 200 staff-hours to prepare the 30 day response to the generic letter. At an assumed hourly rate of \$100 per staff hour, this totals to \$20,000 per reactor unit or about \$728,000 for the industry. We estimate that each recipient would take approximately 550 staff-hours to prepare the 90 day response to the generic letter. At an assumed hourly rate of \$100 per staff hour and 104 reactor units, this totals to \$55,000 per reactor unit or about \$5,720,000 for the industry. The total cost to the industry to respond to the GL is about \$6,448,000.\

The following table shows the estimated industry costs for licensees to return to compliance with the regulations, if applicable.

Item	Unit Cost	Hours/Reactor	No. Of Reactors	Total Cost
Functionality Assessment (Electronic cable routing tracking system)	\$100/hr	200	2.5	\$50,000
Functionality Assessment (Paper cable tracking routing system)	\$100/hr	400	2.5	\$100,000
Fire Watches	\$25/hr	26,280	23.5	\$14,451,465
Manual Actions Training	\$100/hr	180	47	\$846,000
Reactor Operator Training	\$100/hr	400	47	\$1,880,000

9

Deterministic SSC Analysis	\$100/hr	2,500	15.5	\$3,875,000
Risk Informed SSC Analysis	\$100/hr	1,500	15.5	\$2,325,000
Perform Fire PRA	\$100/hr	5,500	16	\$8,800,000
NEI 04-02 Risk Informed Analysis	\$100/hr	2,000	16	\$3,200,000
License Exemption/ Amendment	\$100/hr	400	47	\$1,818,505
Design & Implement Modifications	\$1,000,000/reactor unit	N/A	47	\$43,644,359
<b>Industry Implementation Total</b>				<b>\$80,990,329</b>

**(c) An anticipated schedule for NRC use of the information.**

The schedule would be as follows:

August 2006	GL issuance
Sept. 2006	Receipt of responses from addressees who cannot meet the response date
Sept. 2006 - Dec. 2006	Receipt of final responses from addressees
Sept. 2006 - Sept. 2009	Review and tracking of final responses from addressees

**(d) A statement affirming that the request does not impose new requirements on the licensee, other than submittal of the requested information.**

The information requested is described in the response to item i above and is restricted to information for verifying compliance with existing regulations consistent with licensees' existing licensing basis. No new requirements are imposed.

**(e) The proposing office director's determination that the burden to be imposed on the respondents is justified in view of the potential safety significance of the issue to be addressed in the requested information.**

NRC fire protection regulations have been established to limit fire damage to NPP structures, systems, or components important to safety so that the capability to shut down the plant safely is not impaired. Compliance with these regulatory requirements or commitments is necessary to ensure public health and safety in the event of a fire at a licensed NPP. The burden estimated in Part b above is justified by the assurance that the plant is able to safely shutdown in the event of a fire.

**Under the provisions of 10 CFR 50.54(f), unless the request for information is for the purpose of verifying compliance with the licensing basis of a facility, the EDO**

10

**shall approve the staff's justification. Additional guidance for preparing this evaluation is provided in Section 5.4 of NUREG/BR-0058, Revision 2.**

**Include an analogous evaluation addressing items (a) through (e) for each information request directed to the licensees of the selected nuclear materials facilities or referred to in Section III of the CRGR Charter.**

The remainder of this item is not applicable. The GL is proposed for the purpose of verifying compliance with the current regulations.

- (xi) **For each proposed power reactor backfit analyzed pursuant to 10 CFR 50.109(a)(2) (i.e., backfits other than either adequate protection or compliance backfit[s]), an assessment of how the proposed action relates to the Commission's Safety Goal Policy Statement.**

Not applicable. This GL is a compliance backfit, proposed for the purpose of verifying compliance with the current regulations.