POLICY ISSUE
(Notation Vote)

September 11, 2006 SECY-06-0196

FOR: The Commissioners

FROM: Luis A. Reyes
Executive Director for Operations /RA/

SUBJECT: ISSUANCE OF GENERIC LETTER 2006-XX, "POST-FIRE SAFE-SHUTDOWN CIRCUITS ANALYSIS SPURIOUS ACTUATIONS"

PURPOSE:

To inform the Commission that the U.S. Nuclear Regulatory Commission (NRC) staff intends to issue the subject generic letter (GL). This paper does not address any new commitments or resource implications.

BACKGROUND:

The regulatory requirements for post-fire safe shutdown are given in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50.48 and General Design Criterion 3, "Fire Protection," in Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Additionally, all nuclear power plants (NPPs) licensed to operate before January 1, 1979, are required to comply with Section III.G, "Fire Protection of Safe Shutdown Capability," of Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," to 10 CFR Part 50. All NPPs licensed to operate after January 1, 1979, were evaluated against Section 9.5.1 of

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NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants.” The fire protection program (FPP) and the associated safety evaluation report are specifically incorporated into those plants’ licensing bases. All NPP licensees are responsible for meeting the fire protection requirements.

The objective of the fire protection requirements and guidance is to ensure that one train of systems necessary to achieve and maintain safe shutdown remains 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 FPP, each licensee performs a circuit analysis to identify these circuits and to provide adequate protection against fire-induced failures.

Beginning in 1997, the 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. Based on the number of similar LERs, the NRC treated the issue generically. In 1998, the 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, Revision 2, to provide a process for treating inspection findings while the issues were being clarified. The staff documented these problems in Information Notice 99-17, “Problems Associated With Post-Fire Safe-Shutdown Circuit Analyses.” Because different stakeholders interpreted the 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, Division of Systems, Safety and Analysis, NRR) dated November 29, 2000 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML003773142).

In 2001, the Electric Power Research Institute (EPRI) and the Nuclear Energy Institute (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 circuit failures (hot shorts, open circuits, and shorts to ground). 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, “Cable Insulation Resistance Measurements Made During Cable Fire Tests”, (ADAMS Accession Nos. ML022600200 and ML022600307). Based on the test results, the 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:

In the GL, the staff requests licensees of light-water nuclear power reactors to review their FPPs to confirm compliance with applicable regulatory requirements in light of the relatively high probability of fire-induced circuit failures. The staff requests licensees to submit a description of their licensing basis regarding multiple spurious post-fire safe-shutdown circuit analyses and their conclusion regarding compliance with the regulatory requirements described in the GL. For those licensees who conclude that they are not in compliance with regulatory requirements, the staff requests their plan to establish compliance with regulatory requirements for the affected structures, systems, and components. A copy of the proposed GL is provided as

Enclosure 1.

The staff issued the draft GL in the *Federal Register* on October 19, 2005, and provided a 60-day comment period. At the request of industry, the staff reopened the comment period in the *Federal Register* on December 22, 2005. Subsequently, the staff held a public meeting to inform the industry and other stakeholders about the disposition of comments and to provide an opportunity for additional clarifications. Enclosure 2 provides a summary of the comments and the staff's responses. In addition, the staff revised the GL in response to the comments in the Advisory Committee for Reactor Safeguards (ACRS) letter dated June 16, 2006 (ADAMS Accession No. ML061670327).

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 the GL and make the necessary modifications. Another way to address the issue is to perform either a risk-informed evaluation that considers defense-in-depth and safety margins or a deterministic evaluation.

The licensees who committed to adopt 10 CFR 50.48(c), the National Fire Protection Association (NFPA) 805 standard, can address the noncompliances during their transition to NFPA 805.

The staff has assessed whether immediate regulatory action is necessary while licensees respond to the subject GL, and has determined that continued operation is justified because there are several levels of defense-in-depth (DID) in place for fire protection in addition to the protection of cables from fire damage by separation. The other levels of DID (fire detection, fire suppression, fire barriers, administrative controls) are not affected by multiple spurious actuations.

The staff recognized the potential for significant burdens that could be imposed on the licensees due to this GL. Therefore, the staff has been communicating to licensees the results of the EPRI/NEI cable fire tests, and the staff's expectations, through a series of public meetings since 2003. In addition, the staff performed a regulatory analysis (ADAMS Accession No. ML061950043) and evaluated options available for licensees to reestablish compliance with the regulations. The staff concluded that the GL provides the preferred approach to identify and resolve potential risk-significant situations associated with the credible multiple-spurious actuations caused by fires.

By letter dated August 25, 2006, NEI notified the staff of their plans to submit comments on this regulatory analysis. The staff will consider any new comments and revise the regulatory analysis or take other action, as appropriate. Due to the importance of bringing these fire protection issues to resolution and the recognition that the draft GL was published for an extended public comment period and each of the comments was addressed, the staff has decided to move forward with the proposed GL.

The staff recognizes that licensees who do not comply with the fire protection regulations need time to re-analyze some of their circuits in light of the information provided in this GL. The staff plans to revise its enforcement guidance to provide continued enforcement discretion on circuits issues related to multiple spurious actuations findings in light of the information provided in the GL as described below.

Enforcement discretion will be exercised for noncompliances attributed to circuit issues related to multiple spurious actuations provided that, within the initial 90-day period referenced in the subject GL, licensees: (1) notify the NRC that they may not be in compliance; (2) implement compensatory measures; (3) enter the noncompliances into their corrective action program; and (4) within 6 months of the date of the GL, submit to the NRC their plan and schedule to establish compliance with regulatory requirements. The NRC expects timely completion of the corrective actions consistent with Regulatory Issue Summary 2005-20, "Revision to Guidance Formerly Contained in NRC Generic Letter 91-18." This enforcement discretion will continue provided that appropriate compensatory measures are maintained and the planned corrective actions are completed by March 6, 2009.

COORDINATION:

The Committee To Review Generic Requirements (CRGR) reviewed the GL on April 25, 2006, and endorsed it after the staff incorporated CRGR comments. The ACRS reviewed the GL on May 31, 2006, and recommended that it be issued after the staff incorporated ACRS comments. The Office of the General Counsel reviewed the GL and had no legal objection to its content. The Office of the Chief Financial Officer reviewed the GL and had no objections based on budget or financial management concerns or potential resource impacts.

The subject GL is not a major “rule” under the Small Business Regulatory Enforcement Fairness Act of 1996, and the Office of Management and Budget has confirmed this determination.

/RA William F. Kane Acting For/

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Executive Director
for Operations

Enclosures:
1. Generic Letter 2006-XX
2. Resolution of Public Comments

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 (FPP) to confirm compliance with applicable regulatory requirements regarding their interpretation of multiple spurious actuations caused by circuit faults (hot shorts, open circuits, and shorts to ground), in light of the information provided in this GL and, if appropriate, take additional actions to establish 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"), 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 NRC is reaffirming the position that multiple spurious actuations caused by circuit failures must be considered and evaluated per 10 CFR 50.48, "Fire protection," and General Design Criterion (GDC) 3, "Fire Protection," in Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." This failure mode 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," issued May 2002 and NUREG/CR-6776, "Cable Insulation Resistance Measurements Made During Cable Fire Tests," issued June 2002) (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML022600200 and ML022600307). Some licensees have assumed a single spurious actuation per fire event, and others have assumed that multiple spurious actuations can only occur with

sufficient time between them to allow for mitigation. The EPRI/NEI test data clearly show that the 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 GDC 3 in Appendix A to 10 CFR Part 50, which require that structures, systems, and components (SSCs) 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 GDC 3 in Appendix A to 10 CFR Part 50, based on the information provided in this GL, should implement compensatory measures and inform the staff of their planned corrective actions to establish compliance with 10 CFR 50.48 and GDC 3 in Appendix A to 10 CFR Part 50.

BACKGROUND

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

The objective of the fire protection requirements and guidance is to ensure that one train of systems necessary to achieve and maintain safe shutdown remains 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 FPP, each licensee performs a circuit analysis to identify these circuits and to provide adequate protection against fire-induced failures.

Beginning in 1997, the 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. Based on the number of similar LERs, the NRC treated the issue generically. In 1998, the 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, Revision 2 (ADAMS Accession No. ML003710123), to provide a process for treating inspection findings while the issues were being clarified. The staff documented these problems in Information Notice (IN) 99-17, "Problems Associated With Post-Fire Safe-Shutdown Circuit Analyses," issued June 3, 1999. Because different stakeholders interpreted the 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, Division of Systems and Safety Analysis, 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 circuit failures. 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 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 circuit failures, 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 Legacy Accession No. 8411200507). However, the staff has concluded the regulations 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.

The letter from S. J. Collins (NRC) to R. E. Beedle (NEI) dated March 11, 1997 (ADAMS Accession No. ML003716454), the NRC reiterated its position that multiple spurious actuations caused by circuit failures 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 NPPs. During the testing, numerous variables were introduced to investigate the impact of various factors on cable performance and failure characteristics.

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 protection described in paragraph III.G.2 of Appendix R to 10 CFR Part 50 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 (NUREG-0876, Supplement 6), 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. All licensees are requested to 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 not in compliance with the fire protection regulations. Licensees who so determine shall implement compensatory measures and inform the staff of their plan of corrective actions to establish compliance with 10 CFR 50.48 and GDC 3 in Appendix A to 10 CFR Part 50. One acceptable corrective action is to make plant modifications to protect against possible multiple spurious actuations. Another is to justify an exemption (or license amendment, as applicable) as described in the Methods Of Compliance section of this GL.

The letter from D. J. Modeen (NEI) to L. B. Marsh (NRC) dated May 30, 1997 (ADAMS Legacy Accession No. 9706110218), 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," issued April 24, 1986. 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 Section III.L, "Alternative and Dedicated Shutdown Capability," of Appendix R. 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 paragraph III.G.2 of Appendix R to 10 CFR Part 50.

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) (ADAMS Accession No. ML053190328) 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 necessary to accomplish the required reactor performance goals). Again, these alternative requirements do not provide the same level of protection as required by paragraph III.G.2 of Appendix R to 10 CFR Part 50.

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 dated 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 GDC 3 in Appendix A to 10 CFR Part 50, 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 circuit failures 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 in accordance with 10 CFR 50.12 or a license amendment in accordance with 10 CFR 50.90, the licensee should follow the guidance of Regulatory Guide (RG) 1.174, Revision 1, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,” issued November 2002 (ADAMS Accession No. ML023240432).

Licensees who have adopted the standard fire protection license condition in GL 86-10 can make changes to the approved FPP without prior NRC approval if the changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire. The NRC provides guidance in GL 86-10 on performing and documenting these changes. Plants licensed after January 1, 1979, that use a risk-informed approach should 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 staff. Pending NRC review and approval of these methods, the NRC staff cannot accept that risk calculation methods adequately demonstrate that a change or noncompliance “would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.”
An additional method to achieve compliance is the adoption of a performance-based FPP in accordance with 10 CFR 50.48(c), “National Fire Protection Association Standard 805 (NFPA 805).” RG 1.205, “Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants,” issued May 2006 (ADAMS Accession No. ML061100174), and NEI 04-02, “Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c),” Rev. 1, issued September 2005 (ADAMS Accession No. ML052590476), provide additional guidance to licensees planning to use this option.

APPLICABLE REGULATORY REQUIREMENTS

NRC regulations in 10 CFR 50.48 and GDC 3 in Appendix A to 10 CFR Part 50 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 SSCs 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, must submit an exemption request in accordance with 10 CFR 50.12 to deviate from the rule.

All NPPs licensed to operate before January 1, 1979 (pre-1979 plants), are required to comply with paragraph III.G of Appendix R to 10 CFR Part 50, which 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 a Fire Protection Plan that satisfies GDC 3 in Appendix A to 10 CFR Part 50. 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 FPPs 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 circuit failures 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 the number of spurious actuations that licensees must consider. 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 spurious actuation that are concurrent or in rapid succession 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 RG 1.205, and may be used in the evaluations.

The deterministic methodology in Chapter 3 of NEI 00-01, Revision 1 "Guidance for Post-Fire Safe Shutdown Circuit Analysis," issued January 2005 (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 effect 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. Licensees should address all potential impacts within the fire area.

The risk significance analysis methodology provided in Chapter 4 of NEI 00-01 should not be applied as a basis for regulatory compliance except for cases in which a licensee has adopted an NFPA 805 licensing basis in accordance with 10 CFR 50.48(c) or used it to support exemption and license amendment requests for plants that have not adopted an NFPA 805 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

The NRC requests all addressees to take the following actions:

(1) Within 90 days of the date of this letter, all addressees are requested to evaluate their licensing bases 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 safe-shutdown trains from multiple simultaneous spurious actuations and maintaining one train free of fire damage.

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.

(2) If addresses 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 complete plans

within 6 months of the date of this letter for plant modifications, license amendments, exemption requests, or other means to meet the regulatory requirements.

REQUESTED INFORMATION

The NRC requests all addressees 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. The 90-day response should also include the addressee's conclusion regarding compliance with the regulatory requirements described in this GL.

(2) If addresses conclude that their plants are not in compliance with regulatory requirements, within 6 months of the date of this GL, submit the plan and schedule to establish compliance with regulatory requirements for the affected SSCs.

REQUIRED RESPONSE

In accordance with 10 CFR 50.54(f), an addressee must 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 must submit a written response if it cannot provide the information or cannot meet the requested completion date. The response must address any alternative course of action that it proposes to take, including the basis for the acceptability of the proposed alternative course of action.

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 circuit failures have to be considered in a post-fire safe-shutdown circuits analysis. The cable fire testing performed by EPRI/NEI 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 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.

Regulatory Issue Summary (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 2005-20, "Revision to Guidance Formally 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.

RIS 2005-30, "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 discussed in this GL. The NRC position has been that all multiple spurious actuations caused by circuit failures have to be considered in a post-fire safe-shutdown circuits analysis. Also, 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 circuit failures 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 circuit failures, 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. However, the staff has concluded 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 of the two licensee interpretations described above conforms with the likely effects of a fire in an area containing safe-shutdown cables. The staff's positions in this GL with respect to current fire protection requirements have not changed and do not constitute back fitting as defined in
10 CFR 50.109(a)(1).

NRC recognizes it has issued SERs that accepted both of the above interpretations for specific situations in specific plants (e.g., NUREG-0876, Supplement No. 6, SER for Byron Station Units 1 and 2 and Braidwood Station Units 1 and 2). Therefore, 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 back fits 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 GDC 3 in Appendix A to 10 CFR Part 50. 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 GDC 3 in Appendix A to 10 CFR Part 50, and the inconsistencies would be rectified by any back fitting imposed by the NRC consistent with this GL. Therefore, Byron and Braidwood, like all other addressees, are required to respond to this GL and are requested to provide information for the NRC to determine if additionally regulatory action is warranted.

The 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 GDC 3 in Appendix A to 10 CFR Part 50.

FEDERAL REGISTER **NOTIFICATION**

The NRC published a notice of opportunity for public comment on this GL in the *Federal Register* (FR) (70 FR 60859) on October 19, 2005. At the request of the industry, the NRC subsequently published a notice reopening the public comment period for this GL in the FR (70 FR 76083) on December 22, 2005. A public meeting was held on March 1, 2006, to discuss the staff’s responses to the public comments. The staff’s evaluation of public comments is publicly available through ADAMS Accession No. ML062190464.

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 approval number 3150-0011, which expires on February 28, 2007.

The burden to the public for these mandatory information collections is estimated to range from 180 hours per licensee for compliant licensees to 1,100 hours per licensee for non-compliant licensees, for an average of 600 hours per licensee. This includes 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 Freedom of Information Act/Privacy Services Branch (T5-F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet electronic mail to 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.

CONTACT

Please direct any questions about this matter to the technical contact or the lead project manager listed below or to the appropriate NRR project manager.

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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

Source of Comments (Agencywide Document Access Management System Accession Number)	**Comment Designator**	**Remarks**
Dominion Resources Services, Inc. (ML053630063)	D	Received December 20, 2005
General Electric (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
TVA (ML060410050)	V	Received February 8, 2006
Boiling-Water Reactor (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

Bin No.	Description
1	Comments on risk-informed circuits analysis
2	Comments on Electric Power Research Institute (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 Regulatory Information Summary (RIS) 2004-03, Rev. 1 to meet compliance expectations concerning 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 must be addressed.

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, a licensee should not use risk-informed methods for circuit analysis without prior staff approval of such methods, because their risk analysis methods may not be acceptable to the staff.

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 to acknowledge that NEI 00-01 provides an acceptable approach for a risk-informed licensing basis in the National Fire Protection Association (NFPA) Standard 805 Regulatory Guide or for justifying exemption or license amendment requests.

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. A risk screening tool (reviewed and approved by the staff) to focus resources on risk significant configurations may be of use.

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 an exemption or license amendment 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. The binned issues that require additional research 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.

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 must be addressed.

Comment:

General Electric Comment G1, BWR Owners' Group Comment B1, Exelon/Amerigen Comment X1 - The *Federal Register* (FR) notice (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 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/license amendment 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-feet 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:

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. A licensee may include the above issues in an exemption or license amendment request. A risk screening tool (reviewed and approved by the staff) to focus resources on risk-significant configurations may be of use.

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 or license amendment 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 must be addressed.

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:

The language quoted in the comment 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.” It does not provide, nor can it be reasonably interpreted as suggesting, that only sequential spurious actuations must be considered. Accordingly, the staff does not believe that draft NUREG 1778 provides a credible basis for a backfitting claim.

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.

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 or license amendment request. 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 meters (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 Title 10 of the *Code of Federal Regulations,* Part 50.48(c) (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 is an information request in accordance with 10 CFR 50.54(f). Information requests are not considered by the NRC to be subject to the Backfit Rule, 10 CFR 50.109. Furthermore, the GL is based on current regulations and guidance and does not constitute a change in NRC staff position. 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 compliance backfits under 10 CFR 50.109(a)(4)(i). These staff positions constituted staff inconsistencies with respect to the necessary prerequisites for demonstrating compliance with the regulations, and the inconsistencies would be rectified by any backfitting imposed by the NRC consistent with the GL.

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 has determined, in accordance with 10 CFR 50.54(f), that the information sought in the GL is necessary to verify licensee compliance with existing regulatory requirements described in 10 CFR 50.48 and 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 3, in order to protect public health and safety.

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:

The NRC is using this generic communication as an information request to determine if licensees are in compliance with the regulations. Information requests are not considered by the NRC to be subject to the Backfit Rule, 10 CFR 50.109. Furthermore, the GL is based on current regulations and guidance and does not constitute a change in NRC staff position. 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 compliance backfits under 10 CFR 50.109(a)(4)(i). These staff positions constituted staff inconsistencies with respect to the necessary prerequisites for demonstrating compliance with the regulations, and the inconsistencies would be rectified by any backfitting imposed by the NRC consistent with the GL.

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 safety evaluation reports (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 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 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 two or three 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 or license amendment

request.

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 included in this proposed GL should be addressed.

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 or license amendment 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 or license amendment 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 1, 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, we will delete it.

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 GL submit the plan and schedule to establish compliance with regulatory requirements for the affected structures, systems, and components." 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 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."

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 probabilistic risk assessment (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 and license amendment requests. A risk screening tool (reviewed and approved by the staff) to focus resources on risk significant configurations may be of use.