

NUCLEAR REGULATORY COMMISSION

Proposed Generic Communication

Clarification of Post-Fire Safe-Shutdown Circuit Regulatory Requirements

AGENCY: Nuclear Regulatory Commission.

ACTION: Notice of opportunity for public comment.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is proposing to issue a regulatory information summary (RIS) to clarify regulatory requirement issues associated with post-fire safe-shutdown circuit analyses and protection, particularly the requirements of Title 10 of the Code of Federal Regulations, Part 50 (10 CFR 50), Appendix R, which have been interpreted by licensees in a manner that is not consistent with regulatory expectations.

The industry and NRC regional inspectors have requested clarification of regulatory expectations with respect to post-fire safe-shutdown circuits. In addition, clarification of these requirements will assist licensees in evaluating the transition to a risk-informed, performance-based fire protection program.

Three terms are to be addressed in this RIS: "any-and-all" (with respect to spurious actuations), "associated circuits," and "emergency control station." Clarification of the term "one-at-a-time" (with respect to spurious actuations) will be provided in a separate generic communication. For each term addressed, this RIS identifies the applicable NRC regulatory requirement, provides the regulatory expectation with respect to the requirement, and specifies one acceptable approach to achieving regulatory compliance.

Attachment 1 to this RIS provides additional discussion that explains the basis for the regulatory expectations, including a discussion of the various ways in which each term or phrase has been interpreted by stakeholders.

This RIS also gives the staff's views on the use of Nuclear Energy Institute (NEI) guidance document NEI 00-01, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Revision 1 (ML050310295), in complying with Appendix R. The deterministic methodology presented in NEI 00-01, in conjunction with the guidance in this RIS, is one acceptable approach to achieving regulatory compliance with post-fire safe-shutdown circuit protection requirements.

Note that RIS 2004-03, Revision 1, "Risk-Informed Approach for Post-Fire Safe-Shutdown Circuit Inspections" (ML042440791) provides guidance on conducting risk-informed circuit inspections, whereas this RIS clarifies the regulatory requirements for compliance with Appendix R.

This *Federal Register* notice is available through the NRC's Agencywide Documents Access and Management System (ADAMS) under accession number ML051110160.

DATES: Comment period expires [60 days after FRN is published]. Comments submitted after this date will be considered if it is practical to do so, but assurance of consideration cannot be given except for comments received on or before this date.

ADDRESSEES: Submit written comments to the Chief, Rules and Directives Branch, Division of Administrative Services, Office of Administration, U.S. Nuclear Regulatory Commission, Mail Stop T6-D59, Washington, DC 20555-0001, and cite the publication date and page number of this *Federal Register* notice. Written comments may also be delivered to NRC Headquarters, 11545 Rockville Pike (Room T-6D59), Rockville, Maryland, between 7:30 am and 4:15 pm on Federal workdays.

FOR FURTHER INFORMATION, CONTACT: Robert F. Radlinski at 301-415-3174 or by email rrf1@nrc.gov, Chandu Patel at 301-415-3025 or email cpp@nrc.gov, or Sunil Weerakkody at 301-415-2870 or by email at sdw1@nrc.gov.

SUPPLEMENTARY INFORMATION:

NRC REGULATORY ISSUE SUMMARY 2005-XX

CLARIFICATION OF POST-FIRE

SAFE-SHUTDOWN CIRCUIT REGULATORY REQUIREMENTS

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.

INTENT

The U.S. Nuclear Regulatory Commission (NRC) is issuing this regulatory issue summary (RIS) to clarify regulatory requirement issues associated with post-fire safe-shutdown circuit analyses and protection, particularly the requirements of Title 10 of the Code of Federal Regulations, Part 50 (10 CFR 50), Appendix R, which have been interpreted by licensees in a manner that is not consistent with regulatory expectations.

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This RIS requires no action or written response on the part of an addressee.

BACKGROUND INFORMATION

The regulatory requirements regarding post-fire safe shutdown are contained in 10 CFR 50.48 and 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 3. Additionally, all nuclear power plants (NPPs) licensed to operate prior to 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, Standard Review Plan (SRP). 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 provide reasonable assurance that one train of systems necessary to achieve and maintain hot shutdown is free of fire damage. This includes protecting 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 hot shutdown. The staff documented these problems in Information Notice 99-17, "Problems Associated With Post-Fire Safe-Shutdown Circuit Analysis." 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 (EGM) 98-002, Revision 2 (ML003710123), 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 portion of fire protection inspections. This decision is documented in an NRC memorandum from John Hannon to Gary Holahan dated November 29, 2000 (ML003773142). In 2001 the Electric Power Research Institute (EPRI) and NEI performed a series of cable functionality fire tests to further the nuclear industry's knowledge about the nature and characteristics of fire-induced circuit failures, particularly the potential for spurious equipment

actuations initiated by hot shorts. The Electric Power Research Institute (EPRI) coordinated this effort and issued the final report, "Spurious Actuation of Electrical Circuits Due to Cable Fires: Results of an Expert Elicitation" (Report No. 1006961, May 2002).¹ The results of the testing were considered in the preparation of NEI 00-01.

Over the past 5 years, the industry and the staff have worked together to gain a better understanding of possible and probable modes of circuit failures. This work has included numerous meetings and facilitated public workshops. Based on this work the staff has identified circuit configurations that are likely to fail in the event of a fire and circuit configurations that have little or no likelihood of failing. The results of this work are reflected in RIS 2004-03 and in the revised inspection procedures. Inspection of fire-induced safe-shutdown circuits was resumed in January 2005.

The issues clarified in this RIS were discussed in an NRC public meeting on October 14, 2004, in Atlanta, GA (Summary of October 2004 Public Meeting on Fire Protection in Atlanta, **ML043290020**). The clarifications in this RIS have considered the comments provided by stakeholders during the October meeting and subsequent to the meeting.

SUMMARY OF ISSUE

Although the NRC has issued a number of guidance documents to assist licensees in assuring compliance with fire protection requirements, certain terms related to post-fire safe-shutdown circuit analysis have been interpreted differently by stakeholders or in a manner inconsistent with our regulatory expectations/requirements. In accordance with SECY-99-143, "Revisions to Generic Communication Program," dated May 26, 1999 (ML992850037), the staff believes that a RIS is the appropriate regulatory vehicle to address this need for additional clarification. This

¹Additional analysis of the EPRI/NEI test results can be found in NUREG/CR-6776, "Cable Insulation Resistance Measurements Made During Cable Fire Tests," which can be accessed on the NRC's public Web site.

RIS clarifies terms related to post-fire safe-shutdown circuits to help a licensee understand the staff's expectations with respect to regulatory requirements.

The variety of interpretations of the terms addressed in this RIS is due in part to the previous lack of knowledge regarding the potential for certain types of circuit failure mechanisms. The cable fire tests performed by EPRI/NEI significantly increased the body of knowledge available to the industry and the NRC with respect to fire-induced circuit failures and their potential to cause spurious actuations that could impact post-fire safe shutdown. The staff positions presented in this RIS are justified based on the potential safety significance of these issues and on compliance with the current regulations applicable to these circuits. The staff positions are also consistent with the National Fire Protection Association (NFPA) industry consensus standard NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition, as they relate to deterministic-based fire protection program features.

The positions presented in this RIS describe the bases for compliance with the current deterministic regulations applicable to post-fire safe-shutdown circuits. With the issuance of 10 CFR 50.48(c), licensees have the alternative of adopting a fire protection licensing basis which allows the use of risk-informed, performance-based methods to address program features that do not comply with the deterministic regulations. In accordance with 10 CFR 50.12 and 10 CFR 50.90, licensees may also submit exemption requests or license amendment requests for NRC's consideration where deviations from the regulatory requirements can be adequately justified for a plant-specific condition.

The deterministic methodology in NEI 00-01, Chapter 3, for analysis of post-fire safe-shutdown circuits, in conjunction with the guidance provided in this RIS, is one acceptable approach to achieving regulatory compliance with post-fire safe-shutdown circuit protection requirements.

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 an NFPA 805 licensing basis has been adopted in accordance with 10 CFR 50.48(c). Risk-informed or performance-based methodologies which use the methods and information provided in NEI 00-01 (e.g., Chapter 4 and Appendix B-1) may also be used to support exemption requests for plants that have not adopted an NFPA 805 licensing basis. Furthermore, regardless of the plant licensing basis, the NRC endorses 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 plant 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.

The phrase "one-at-a-time," as used to characterize fire-induced hot shorts that cause spurious actuations that could impact safe shutdown has been interpreted in a number of different ways. However, since the staff position on the regulatory basis for this phrase may be considered a new staff position by some stakeholders, the staff position on this phrase will be handled in a separate generic communication.

Three terms are to be addressed in this RIS: "any-and-all" (with respect to spurious actuations), "associated circuits," and "emergency control station." The discussion for each term includes a summary description of the regulatory requirement, a statement of the NRC staff position and a method to achieve compliance. A more detailed discussion of the staff's positions is contained in the Attachment.

ANY-AND-ALL

A. NRC Regulatory Requirement - Paragraph III.G.2 of Appendix R states that "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" must be protected.

B. NRC Staff Position - The requirement to protect against "any-and-all" spurious actuations is implicit in Paragraph III.G.2. Post-fire safe-shutdown circuit analyses should address any-and-all possible failures and combinations of multiple failures caused by spurious actuations resulting from fire-induced circuit failures in redundant systems in areas in which the failures could impact safe shutdown (III.G.2 areas).

The requirement to protect against "any-and-all" possible failures includes, for example, the requirement to protect against a possible failure of a motor operated valve as a result of a fire-induced spurious signal that could override the valve motor's protective features, causing valve failure, where such fire-induced valve damage could impair the capability to shut down the plant and maintain it in a safe-shutdown condition.

C. Method To Achieve Compliance - The staff position described above with respect to the term "any-and-all" is consistent with the circuit analysis approach described in NEI 00-01, Revision 1. The deterministic methodology presented in Chapter 3 and Appendix B of NEI 00-01, in conjunction with the guidance provided in this RIS, is one acceptable approach to achieving regulatory compliance with respect to the application of the term "any-and-all." Further discussion of the staff's position on this issue is contained in the Attachment.

ASSOCIATED CIRCUITS

A. NRC Regulatory Requirement - Appendix R, Section III.G.2, states: "Except as provided for in paragraph G.3 of this section, 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..."

B. NRC Staff Position - Any-and-all cables that could cause maloperation of redundant

trains in a III.G.2 area due to fire-induced hot shorts must be protected. Unless approved by the NRC, post-fire safe-shutdown circuit analyses may not credit operator manual actions (under current regulations for plants that have not adopted an NFPA 805 licensing basis) for protection against spurious actuations caused by fire-induced failure of circuits associated with a redundant safe shutdown train located in a III.G.2 area.

The requirement to protect "associated" circuits includes a requirement to protect against circuits that are themselves not directly required to perform safe-shutdown function but which could cause a spurious actuation that could impact safe shutdown. Therefore, operator manual actions may not be credited for such circuits.

C. Method To Achieve Compliance - The deterministic methodology presented in Chapter 3 and Appendix B of NEI 00-01, in conjunction with the guidance provided in this RIS, is one acceptable approach to achieving regulatory compliance with respect to the application of the term "associated circuit". The NEI 00-01 approach to identifying circuits that must be protected and to protecting those circuits is consistent with the NRC position on this issue.

Further discussion of the staff's position on this issue is contained in the Attachment.

EMERGENCY CONTROL STATION

A. NRC Regulatory Requirement - 10 CFR Part 50, Appendix R, Section I, "Introduction and Scope," states: "One train of equipment necessary to achieve hot shutdown from either the control room or emergency control station(s) must be maintained free of fire damage by a single fire, including an exposure fire." Paragraph III.G.1.a of Appendix R also refers to emergency control stations.

B. NRC Staff Position - III.G.1 protection for redundant safe-shutdown systems may not be claimed for redundant systems in a III.G.2 area by crediting an operator manual action at an emergency control station. Unless alternative or dedicated shutdown capability is provided,

redundant circuits credited for post-fire safe shutdown and located in the same fire area must be protected in accordance with III.G.2 without the use of emergency control stations of any kind.

C. Method To Achieve Compliance - The deterministic methodology presented in Chapter 3 and Appendix B of NEI 00-01, in conjunction with the guidance provided in this RIS, is one acceptable approach to achieving regulatory compliance with respect to the application of the term "emergency control station." NEI 00-01 refers to the regulations, the plant licensing basis, and NRC approvals for guidance on this issue. The NEI guidance document also includes the NRC position on this issue without commenting on the position.

Further discussion of the staff's position on this issue is contained in the Attachment.

BACKFIT DISCUSSION

Some inspectors have not challenged alternative licensee interpretations of the regulatory requirements mentioned in this RIS. However, as stated in NUREG-1409, "Backfitting Guidelines," if a determination is made that action is needed to bring the licensee back into compliance with the regulations, no backfit analysis is required. Section 3.3(1) of NUREG-1409 states that "simply not challenging a licensee's practice would not be considered tacit approval." Since this RIS does not change any staff position on the terms addressed herein and does not require an action or written response from licensees, this RIS is not a backfit under 10 CFR 50.109. Consequently, the staff did not perform a backfit analysis.

FEDERAL REGISTER NOTIFICATION

The subject matter of this RIS was discussed on October 14, 2004, at a public meeting in Atlanta, Georgia. Stakeholder feedback was considered in developing the final version of this RIS.

In addition, a notice of opportunity for public comment on this RIS will be published in the *Federal Register*.

SMALL BUSINESS REGULATORY ENFORCEMENT FAIRNESS ACT OF 1996

In accordance with the Small Business Regulatory Enforcement Fairness Act of 1996, the NRC has determined that this action is not a major rule and has verified this determination with the Office of Information and Regulatory Affairs of OMB.

PAPERWORK REDUCTION ACT STATEMENT

This RIS does not contain information collections and, therefore, is not subject to the requirements of the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.).

CONTACT

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

/RA/

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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.

**DISCUSSION OF REGULATORY EXPECTATIONS
POST-FIRE SAFE-SHUTDOWN CIRCUIT ANALYSIS**

The following discussion provides the background of each of the terms that have been clarified by the RIS. This background discussion identifies the various interpretations that have been applied to the terms and notes the regulatory position and the basis for that position for each interpretation.

ANY-AND-ALL

Appendix R, paragraph III.G.2, does not identify any exceptions to the type of post-fire safe-shutdown circuit failures that must be protected against in accordance with III.G.2. However, Generic Letter 86-10 (response to Question 5.3.1) describes two specific exceptions to the circuit evaluation requirement of "all possible functional failure states." These two exceptions are (1) three-phase hot shorts in proper sequence and (2) more than two hot shorts of the proper polarity in ungrounded DC circuits (the response does not allow either of these exceptions to be applied to high/low pressure interfaces). Since these two exceptions were not characterized in GL 86-10 as examples of exceptions, they are the only exceptions allowed by GL 86-10 to the type of post-fire safe-shutdown circuit failures that must be protected against in accordance with III.G.2. Furthermore, it is generally agreed that for a deterministic approach to fire protection, such as that required by Appendix R, a fire is assumed to damage all circuits and equipment in the fire area under consideration. Therefore, any-and-all other post-fire safe-shutdown circuits must be protected in accordance with III.G.2 (unless an alternative or dedicated shutdown system is provided in accordance with III.G.3).

One industry challenge to the "any-and-all" scope of circuit failures defined by Appendix R and

GL 86-10 was presented to the NRC in a letter from R. E. Beedle of NEI dated January 14, 1997, to F. J. Miraglia, Jr. of the NRC and in a letter from D.J. Modeen of NEI dated May 30, 1997, to L. B. Marsh of the NRC. These letters were in response to Information Notice 92-18, "Potential for Loss of Remote Shutdown Capability During a Control Room Fire" (IN 92-18). The letters stated the industry's position on the possible failure of motor operated valves as a result of a fire-induced spurious signal that could override the valve motor's protective features, causing valve failure. Although the industry agreed that IN 92-18 describes a credible failure and that some licensees had addressed this failure mechanism in response to IN 92-18, the industry's position on this type of failure is that it is highly improbable and does not warrant consideration.

The NRC position on this issue, as noted in IN 92-18, is that such fire-induced valve damage could impair the capability to shut down the plant and maintain it in a safe-shutdown condition. In addition, in Regulatory Guide 1.106, "Thermal Overload Protection for Electric Motors on Motor-Operated Valves" (RG 1.106), the staff had stated that if thermal overload protection devices are bypassed, it is important to ensure that the bypassing does not jeopardize the completion of the safety function or degrade other safety systems because of any sustained abnormal circuit currents that may be present.

Following the January 14, 1997, letter from NEI, a public meeting was held on February 7, 1997, in which the NRC staff discussed with NEI the questions and comments in NEI's letter.

Following the meeting, an NRC letter was sent from S. J. Collins dated March 11, 1997, to R.E. Beedle of NEI to further document and clarify the NRC's position on this issue. During the meeting and in the followup letter the staff stated that the safety issue addressed in IN 92-18 does not represent a new staff position and is within the scope of the existing fire protection regulation. Consequently, fire-induced failure, whether direct (failure to perform a safe-shutdown function) or indirect (maloperation that impacts safe shutdown), of a motor-operated

valve that is required for post-fire safe shutdown must be addressed. The May 30, 1997, letter response from NEI did not result in a change to the NRC's original position.

The second NEI letter also questioned whether the potential risk is applicable to fires in areas other than the control room since IN 92-18 identified a potential failure resulting from a control room fire. Regulatory requirements do not identify any exceptions for fires in other areas of the plant. Consequently, if the mechanistic failure of a motor-operated valve, as described in IN 92-18, can be caused by the fire-induced failure of an electrical circuit and prevent safe shutdown, the circuit must be protected. Where a licensee can make a case that this type of failure is possible but not safety significant in a specific fire area, the licensee can apply for an exemption or adopt a licensing basis in accordance with 10 CFR 50.48(c) and address the issue in accordance with this rule.

ASSOCIATED CIRCUITS

The Appendix R requirement to protect circuits from the effects of fire does not exempt any type of circuits and specifically mentions nonsafety circuits to emphasize that all circuits whose fire-induced failure could prevent safe shutdown must be protected from the effects of fire, even nonsafety circuits. The term "associated circuit" has been used to identify circuits that are not directly required to perform a safe-shutdown function (e.g., the control circuit cable to a pump suction valve that is normally in the correct position for post-fire shutdown) but must also not cause a spurious actuation that could impact safe shutdown. However, no distinction is made in Appendix R between circuits whose failure could directly affect safe shutdown and those whose failure could indirectly affect safe shutdown (e.g., by causing spurious actuations).

Note that the term "associated circuits" has a different connotation in Regulatory Guide 1.75, "Criteria for Independence of Electrical Safety Systems," than it does for fire protection.

Regulatory Guide 1.75 defines "associated circuits" as "non-safety-related circuits that are not physically separated or not electrically isolated from safety-related circuits by acceptable

separation distance, safety class structures, barriers, or isolation devices." The "associated circuits" in Appendix R include both safety-related and non-safety-related circuits. 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. In 1981, the NRC issued Generic Letter (GL) 81-12, "Fire Protection Rule" (45 FR 76602, November 19, 1980), to clarify and provide guidance on alternative and dedicated shutdown systems. Enclosure 2 of GL 81-12 gives the following definition of associated circuits (called "associated circuits of concern") as they relate to alternative and dedicated shutdown systems: "In evaluating alternative shutdown methods, associated circuits are circuits that could prevent operation or cause maloperation of the alternative train which is used to achieve and maintain hot shutdown condition due to fire induced hot shorts, open circuits or shorts to ground." The NRC provided additional guidance on alternative and dedicated shutdown systems in a followup memorandum of March 22, 1982, from R.J. Mattson to Darrell G. Eisenhut (ML050140137). This memorandum, which was made publically available, defined associated circuits of concern as follows:

Associated Circuits of Concern are defined as those cables (safety related, non-safety related, Class 1E, and non-Class 1E) that:

1. Have a physical separation less than that required by Section III.G.2 of Appendix R, and;
2. Have one of the following:
 - a. A common power source with the shutdown equipment (redundant or alternative) and the power source is not electrically protected from the circuit of concern by coordinated breakers, fuses, or similar devices, or
 - b. A connection to circuits of equipment whose spurious operation would adversely affect the shutdown capability (e.g., RHR/RCS isolation valves,

ADS valves, PORVs, steam generator atmospheric dump valves, instrumentation, steam bypass, etc.), or

- c. A common enclosure (e.g., raceway, panel, junction) with the shutdown cables (redundant and alternative) and,
 - (1) Are not electrically protected by circuit breakers, fuses or similar devices, or
 - (2) Will allow propagation of the fire into the common enclosure.

As noted above, these definitions of associated circuits were presented in the context of alternative and dedicated shutdown systems and apply to the specific categories of circuits specified in the definitions. The industry has also used the term "associated" to refer to a larger category of circuits that includes all post-fire safe-shutdown circuits that have the potential to cause spurious operations that could prevent or adversely affect safe shutdown. This broader definition of associated circuits has caused confusion about the protection required for post-fire safe-shutdown circuits.

The Mattson/Eisenhut memorandum of March 1982 and Regulatory Guide 1.189, "Fire Protection for Operating Nuclear Power Plants," noted acceptable methods for mitigating spurious actuations, including operator manual actions. However, these methods are only applicable to alternative and dedicated shutdown systems and they do not comply with regulations for protection of post-fire safe-shutdown circuits in III.G.2 areas. The NRC has specifically noted in correspondence with licensees 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 III.G.2 protection. The examples of equipment identified in the above definition belong to a specific category of systems and components that does not include redundant shutdown components and systems.

Redundant safe-shutdown systems are defined in the response to Question 3.8.3 in

GL 86-10 as follows: "If the system is being used to provide its design function, it generally is considered redundant. If the system is being used in lieu of the preferred system because the redundant components of the preferred system do not meet the separation criteria of paragraph III.G.2, the system is considered an alternative shutdown capability." The GL 81-12 definition of associated circuits specifically refers to both redundant and alternative shutdown trains with respect to circuits associated by common enclosures and common power supplies (2.a and 2.c above), but does not mention redundant systems with respect to circuits associated by spurious actuation (2.b above). The examples given in GL 81-12 for components that could spuriously actuate and affect the safe-shutdown capability are not components of normal redundant safe-shutdown systems (the RHR/RCS isolation valves are in a normal redundant safe-shutdown system, but the post-fire function of these valves is to prevent a loss-of-coolant accident). These components were included in the definition as possible alternative shutdown components.

The response to Question 5.3.8 of GL 86-10 allows operators to clear multiple high-impedance faults by manual breaker trips governed by written procedures. This question and response apply to a unique set of circuits associated with redundant safe-shutdown systems by virtue of having a common power supply where multiple high impedance faults could cause a loss of that power supply to the safe-shutdown equipment. The response references III.G.2 areas and allows operator manual action to mitigate the fault. Some licensees have interpreted this response to imply that the regulations allow them to credit operator manual actions in III.G.2 areas for any associated circuit, including circuits whose failure could cause spurious actuations. However, multiple high-impedance faults are not the same as spurious actuation faults. Consequently, this response does not provide a basis for crediting operator manual actions for mitigation of spurious actuations.

The reference to III.G.2 in the GL 86-10 Question 5.3.8 response is recognition that a

high-impedance fault could affect a redundant shutdown train located in a III.G.2 area and does not imply that manual actions may be credited in these areas for other types of faults. It is also important to note that the questions and responses in GL 86-10 are under the heading Alternative and Dedicated Shutdown Capability. Therefore it is not appropriate to apply the guidance provided by this response to the protection of spurious actuation circuit faults for redundant safe-shutdown systems in III.G.2 areas of the plant.

The staff position on associated circuits presented in this RIS is consistent with Section 9.5.1 of the SRP, which distinguishes between "associated circuits" and "associated circuits of concern" by giving a separate definition for each. Associated circuits are defined as "circuits within a fire area that may be subject to fire damage that can affect or prevent post-fire safe shutdown capability." Associated circuits of concern are defined as "those cables (safety-related, non-safety-related Class 1E and non-Class 1E) that do not meet fire separation requirements and have 1) a common power source with the safe shutdown equipment, 2) a connection to circuits for equipment whose spurious operation could adversely affect safe shutdown, or 3) a common enclosure with safe shutdown circuits." This section of the SRP also states: "Manual actions may not be credited in lieu of providing the required separation of redundant systems or associated circuits located in the same fire area unless alternate, dedicated, or backup shutdown capability is provided."

To summarize, circuits that are associated with the operation of credited redundant post-fire safe-shutdown systems in accordance with III.G.2 such as "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" must be protected in accordance with III.G.2 and operator manual actions may not be credited for III.G.2 redundant train circuits under

regulations for plants that have not adopted an NFPA 805 licensing basis (except through staff-approved exemptions for specific manual actions). This staff position was reiterated in a May 16, 2002, NRC letter from J. N. Hannon to A. Marion of NEI (ML021410026). Committee To Review Generic Requirements (CRGR) Meeting Minutes No. 367 (ML021750218) noted that this letter does not contain any new staff positions.

This staff position is also supported by the results of the EPRI/NEI fire testing. The distinction between associated circuits and other safe-shutdown circuits has been used as a basis for addressing hot shorts and spurious actuations that could prevent safe shutdown by crediting operator manual actions to maintain redundant safe-shutdown trains free of fire damage. The tests demonstrated that operator manual actions may not be practical or possible for the required mitigation between multiple spurious actuations since there may not be sufficient time to take action.

To clarify this issue for all stakeholders, future NRC documentation related to post-fire safe-shutdown circuits will not distinguish between associated circuits and other post-fire safe-shutdown circuits, except for alternative and dedicated shutdown systems as defined by GL 81-12. RIS 2004-03, "Risk-Informed Approach for Post-Fire Safe-Shutdown Associated Circuit Inspections" (ML040620400), has been revised and reissued as RIS 2004-03, Revision 1, "Risk-Informed Approach for Post-Fire Safe-Shutdown Circuit Inspections" (ML042440791), to eliminate this distinction in inspection guidance. NFPA 805 uses a similar approach, noting that any circuit whose function or absence of malfunction, including circuits whose failure can cause a spurious actuation, is required for safe shutdown and should be protected from fire.

EMERGENCY CONTROL STATION

The term "emergency control station" has not been clearly defined and it has not been used consistently by the industry. The term was most recently defined in Regulatory Guide 1.189 as

a "location outside the main control room where actions are taken by operations personnel to manipulate plant systems and controls to achieve safe shutdown of the reactor." However, this definition does not tell what type of hardware is considered an emergency control station, a control panel with multiple functions or a single device such as a valve or breaker. The definition also does not indicate the number of emergency control stations that are considered reasonable and acceptable to maintain a single train free of fire damage.

Since Appendix R did not require post-fire protection of automatic functioning of systems, manual actions may be credited to maintain a train free of fire damage in accordance with III.G.1, as noted in an NRC memorandum of July 2, 1982, from R. J. Mattson to R. H. Vollmer (ML050140106). This memorandum, which was made public, notes that for III.G.1 areas, "manual operation of valves, switches and circuit breakers is allowed to operate equipment and isolate systems and is not considered a repair." This allowance for manual operation of individual devices for III.G.1 areas has led to the interpretation that emergency control stations include individual valves, switches, and circuit breakers.

The interpretation of emergency control station to include individual devices has been used by some licensees as a basis for substituting operator manual actions for the protection of redundant safe-shutdown trains located in the same fire area. This industry position is that if operator manual actions can restore a post-fire safe-shutdown train to a free-of-fire-damage condition, the criteria for a III.G.1 level of protection have been met and therefore even where redundant trains are located in the same fire area, the protection requirements of III.G.2 are not applicable. During an NRC internal meeting on May 7, 1986, to discuss SECY-85-306, "Appendix R, Post-Fire Safe Shutdown" (ML050140123), one staff member voiced this industry position. In that meeting, the NRC Office of the Executive Legal Director (now Office of General Counsel) confirmed that the line of reasoning proposed is only applicable to licensees that have

requested and received an exemption, as this position does not meet regulatory requirements.

These meeting minutes later became publicly available.

The requirements of paragraph III.G.1 are not independent of the requirements of paragraph III.G.2 and the requirements are not necessarily progressive. Paragraph III.G.2 states: "Except as provided for in paragraph G.3 of this section, 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:..." Consequently, unless alternative or dedicated shutdown capability is provided, redundant circuits credited for post-fire safe shutdown and located in the same fire area must be protected in accordance with III.G.2 without the use of emergency control stations of any kind. The regulatory requirement to provide either III.G.2 or III.G.3 protection was noted in GL 86-10 (response to Question 5.1.2).

This staff position was reiterated in the May 16, 2002, letter from J. N. Hannon of the NRC to A. Marion of NEI (ML021410026), and Committee To Review Generic Requirements (CRGR) Meeting Minutes No. 367 (ML021750218) noted that this letter does not contain any new staff positions.

This RIS does not give a precise definition of emergency control stations, but clarifies that, under the current regulations, manual actions may not be credited to claim that a III.G.2 area is a III.G.1 area. Where redundant trains are located in the same fire area and where an alternative shutdown capability is not provided, the protection required by III.G.2, including detection and suppression (where noted), must be provided.

The operator manual actions rulemaking currently in process is expected to provide guidance to licensees on using operator manual actions to comply with III.G.2. In addition, licensees may

address these issues by adopting a risk-informed, performance-based fire protection program in accordance with NFPA 805 and 10 CFR 50.48(c).

END OF DRAFT REGULATORY ISSUE SUMMARY

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Dated at Rockville, Maryland, this 4th day of May 2005.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

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