



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

May 19, 1980

ALL LICENSEES WITH REACTOR OPERATING LICENSES ISSUED PRIOR TO JANUARY 1, 1979

Enclosed with this letter is a proposed rule entitled "Fire Protection Program for Nuclear Power Plants Operating Prior to January 1, 1979". This proposed rule adds a new Section 50.48 and Appendix R to 10 CFR Part 50, and is expected to be published in the Federal Register by the end of May. A thirty-day comment period is provided. We are, therefore, transmitting copies of the proposed rule in order to expedite your review and comments.

Sincerely,

  
Darrell G. Bisenhut, Director  
Division of Licensing

Enclosure:  
Proposed Rule - Fire  
Protection

U. S. NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

Fire Protection Program for Nuclear Power Plants

Operating Prior to January 1, 1979

AGENCY: U. S. Nuclear Regulatory Commission

ACTION: Proposed Rule

SUMMARY: The Nuclear Regulatory Commission (NRC) is proposing to amend its regulations to require certain minimum provisions for fire protection in operating nuclear power plants.

DATES: Comment period expires (no extension of the comment period will be granted).

ADDRESSES: Written comments should be submitted to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

FOR FURTHER INFORMATION CONTACT: David P. Notley, Office of Standards Development, U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, phone 301-443-5921.

SUPPLEMENTARY INFORMATION: On March 22, 1975, the Browns Ferry Nuclear Power Plant, owned and operated by the Tennessee Valley Authority, had the worst fire to date in an operating commercial nuclear power plant. The fire was eventually controlled, there was no release of radioactive

material to the environment, and the reactor was safely shut down. However, many of the systems relied on for shutdown of the reactor under both normal and emergency conditions were not available because of extensive damage to control cabling of redundant systems. Although this fire was not a particularly large or serious fire in terms of insurance underwriting loss, it was very serious in terms of the type of equipment that was rendered inoperative. Also of concern following this fire was the attitude and belief among those responsible for managing the fire that water should not be used on burning electrical cables because the resultant electrical faults would be worse than the fire damage. As a consequence, the fire was allowed to burn for more than seven hours before it was extinguished with water.

Two recommendations made by the Special Review Group that investigated the Browns Ferry fire pertained to assurance that the fire protection programs at operating nuclear power plants conform to General Design Criterion 3, Fire Protection, contained in Appendix A to this part (GDC 3). One of the recommendations was that NRC should develop additional specific guidance for implementation of GDC 3 requirements. The other was that NRC should make a detailed review of the fire protection program at each operating plant comparing it to the guidance developed per the above recommendation.

In response to the first recommendation, NRR developed Branch Technical Position Auxiliary Power Conversion Systems Branch 9.5-1 (BTP 9.5-1), "Guidelines for Fire Protection for Nuclear Power Plants" and Appendix A to BTP 9.5-1, "Guidelines for Fire Protection For Nuclear Power Plants Docketed Prior to July 1, 1976."<sup>1</sup> The guidance contained in BTP 9.5-1

<sup>1</sup>Branch Technical Position 9.5-1 and its Appendix A are available from David P. Notley, Office of Standards Development.

was published for public comment in June 1976 as Regulatory Guide 1.120, "Fire Protection Guidelines for Nuclear Power Plants." As a result of public comments received, the staff proposed extensive changes to the guide and presented the proposed changes to the ACRS in an open meeting in May 1977. Additional written comments were solicited from the public following that meeting. Nineteen additional comment letters were received and they were also considered in Revision 1 of Regulatory Guide 1.120, which was published for a new one-year public comment period in November 1977. Comments received on Revision 1 of Regulatory Guide 1.120 were generally restatements of comments received during earlier comment periods and had already been considered and evaluated by the staff.

The guidelines in both the BTP 9.5-1 and Appendix A to BTP 9.5-1 were developed to provide a fire protection program that has two basic objectives:

1. to identify and distinguish between those consequences of fire that are acceptable and those consequences that are not.
2. to provide necessary means to minimize all consequences of fire and to prevent unacceptable consequences from occurring.

With respect to the first objective, the phenomenon of fire is believed to be sufficiently well understood to permit evaluation of existing and potential fire hazards and probable extent of damage should a fire occur. Such evaluations are useful in assessing the possible consequences of fire in a given area. However, the phenomenon of fire is so unpredictable in occurrence and development that measures to prevent unacceptable consequences may not be omitted on the basis of low probability of occurrence. The minimum fire protection requirements for nuclear

power plants must be established not only to identify fire hazards but also to protect against unacceptable consequences of fire.

In response to the second recommendation of the Special Review Group, the NRC requested every operating plant to (1) compare its fire protection program with the above guidelines and (2) analyze the consequences of fire in each plant area. The NRC then reviewed the licensee's analysis against the guidance contained in Appendix A to BTP 9.5-1 and visited each plant to examine the relationship of the structures, systems, and components important to safety with both in situ and transient fire hazards, the potential consequences of fire, and the associated fire protection features.

Appendix A to BTP 9.5-1 has been used by the staff as a basis for evaluating the adequacy of fire protection provided at all of the presently operating nuclear power plants in the United States. Most of the licensees have accepted most of the staff positions and interpretations of this Appendix A. However, 17 generic issues exist in the fire protection safety analysis reports for 32 plants where agreement has not been reached between the staff and some licensees. In each case the disagreement turns on how to satisfy the basic protection requirement. For instance, all agree on the need for a fire brigade on all shifts. The disagreement is "how large?" The staff says that five should be the minimum size permitted while some licensees say that a brigade of only three or four will be adequate. Similar disagreements exist with each of the basic requirements covered by this proposed rule. Where the staff's safety evaluations contain open items, the position of the staff and the licensees are documented and well known.

There are, however, a few instances where the staff has accepted certain fire protection alternatives that would not satisfy some of the requirements of this proposed rule. The minimum requirements contained in this rule were developed over a 3 year period and, in each of these instances, the staff accepted a proposed alternative before these minimum requirements were established. All licensees will be expected to meet the requirements of this rule, in its effective form, including whatever changes result from public comments.

Because of the above-mentioned differences between the staff and the licensees in the interpretation of the staff's guidelines, it is timely and necessary for the Commission to state what the minimum fire protection requirements will be in each of these contested areas of concern. This proposed rule and its Appendix R have been developed to establish the minimum acceptable fire protection requirements necessary to resolve these contested areas of concern for nuclear power plants operating prior to January 1, 1979.

Other fire protection criteria that have been used by the staff during its plant-specific fire protection program reviews are contained in Appendix A to BTP 9.5-1. The combination of the guidance contained in Appendix A to BTP 9.5-1 and the requirements set forth in this proposed rule define the essential elements for an acceptable fire protection program at nuclear power plants docketed for Construction Permit prior to July 1, 1976, for demonstration of compliance with General Design Criterion 3 of Appendix A to 10 CFR Part 50. Similar acceptable guidance is provided in BTP 9.5-1 for nuclear power plants docketed for Construction Permit after July 1, 1976.

All modifications (except for alternate or dedicated shutdown capability) would be required to be implemented by November 1, 1980, unless for good cause shown the Commission approves an extension. Since the issues involved are well-known and have been under discussion for several years, the Commission anticipates approving few, if any, extensions. No plant would be allowed to continue operating after November 1, 1980, or beyond an extended date approved by the Commission, unless all modifications (except for alternate or dedicated shutdown capability) have been implemented. The Commission recognizes that, in a few instances, approval has previously been given to particular licensees to extend the implementation dates for some modifications beyond November 1, 1980. The Commission will review these extensions on a case-by-case basis to determine whether continued approval or some revision of the extension is appropriate.

For alternate or dedicated shutdown capability, the proposed rule specifies implementation deadlines which depend on which kind of capability is to be implemented and whether the plant is under review in the Systematic Evaluation Program (SEP).<sup>2</sup> For non-SEP plants, the proposed implementation deadlines are April 1, 1981 for alternate shutdown capability and December 1, 1981 for dedicated shutdown capability. Licensees who have committed to earlier implementation dates will be expected to meet those commitments. For SEP plants, the proposed implementation deadlines are December 1, 1981 for alternate shutdown capability and October 1, 1982 for dedicated shutdown capability. The proposed rule requires licensees to submit plans and schedules to meet these implementation deadlines by August 1, 1980 (non-SEP plants) and November 1, 1980 (SEP plants). The Commission may

<sup>2</sup>Plants under review in the SEP include Palisades, Dresden 1 and 2, Oyster Creek, Millstone 1, Ginna, Haddam Neck, San Onofre 1, La Crosse, Big Rock Point, and Yankee Rowe.

revise the implementation deadlines for SEP plants to earlier dates following completion by the NRC staff of its review of the status of fire protection at those plants. The staff review is expected to be completed in August 1980.

A brief description of the major parts of the proposed rule, including the need for each of the specific requirements, follows.

I. Introduction and Scope

This section states that the basic objective of the proposed Appendix R is to specify the minimum fire protection requirements with respect to certain recurring generic issues for nuclear power plants operating prior to January 1, 1979. It limits application to commercial nuclear power electric generating stations and also states that the proposed Appendix R does not rescind any requirements set forth in any Safety Evaluation Report for any nuclear power facility.

II. General Requirements

This section states in general terms the need for a comprehensive fire protection program at each nuclear power plant.

A. Fire Protection Program

The concept of defense in depth is here extended to fire protection (1) to prevent fires from starting, (2) to rapidly detect, control, and promptly extinguish those fires that do occur, and (3) to arrange the structures, systems, and components important to safety so that a fire that starts in spite of the fire prevention activities and that is not promptly extinguished by the fixed automatic or manual fire suppression activities will not prevent the safe shutdown of the plant.

B. Loss of Offsite Power

This section requires that any fire detection or suppression system protecting systems necessary to achieve and maintain safe plant shutdown be capable of functioning with or without offsite power.

C. Manual Fire Fighting

This section requires that manual fire fighting capability (a fire brigade) be provided in all areas containing or presenting a fire hazard to structures, systems, or components important to safety.

D. Access for Manual Fire Fighting

This section requires that access for effective functioning of the fire brigade be provided in all areas containing or presenting a fire hazard to structures, systems, or components important to safety.

E. Fire Hazard Analysis

This section requires that the adequacy of fire protection provided in any area to ensure the ability (1) to safely shut down the plant or (2) to minimize and control the release of radioactivity to the environment be determined by analysis of the effects of fires on structures, systems, or components important to safety in the area.

III. Specific Requirements

Each of the 17 specific fire protection requirements in the proposed Appendix R is described below.

A. Fire Water Distribution System

Two of the lessons learned from the Browns Ferry Fire are (1) that water is the best extinguishing agent available for most potential fires in nuclear power plants and (2) that the sooner a fire is

extinguished, the less total damage results. These two statements recognize that extenuating circumstances in operating plants may preclude the indiscriminate use of water to fight fires in particular locations; however, such circumstances are exceptions. In practical terms, this means that fires in electrical equipment (which may be subject to water damage) should be extinguished as quickly as possible. Water may not be excluded from an area as a fire extinguishant merely on the basis of potential water damage to safe shutdown equipment. If such water damage hazard is severe, other protective measures such as shields for equipment or alternate shutdown capability would be required.

A separate fire water distribution system would be required at each plant to ensure the necessary water supply with adequate pressure and volume for any combination of automatic and manual fire suppression demands.

A looped fire main with appropriate isolation valves provides a higher reliability of furnishing this necessary water supply to fire suppression systems by providing alternate directions of flow during maintenance or repair on part of the system.

Similarly, at least two water sources--tanks and pumps, or pumps alone from a large body of water such as a lake or a river--are necessary to ensure continuity of water supply. In the case of two intakes from a single large body of water, the intakes must be separated from each other so as to really ensure two separate sources.

B. Sectional Control Valves

This item requires the installation of approved visually indicating sectional control valves, such as Post Indicator Valves, to isolate portions of the fire main for maintenance or repair without shutting off the entire system.

C. Hydrant Block Valves

This item requires block valves to be installed in hydrant laterals if necessary to isolate a hydrant from the yard main without interrupting fire water supply to areas containing safety-related or safe shutdown equipment.

D. Manual Fire Suppression

This item requires that a standpipe system with an adequate number of hose stations located throughout the plant to ensure that all areas containing safety-related cabling and equipment can be reached with at least one effective hose stream. The staff has relied on physical separation of safety-related cables and equipment and has made extensive use of automatic fire detection and suppression systems for additional protection of safety-related cabling and equipment. The staff recognizes, however, the limits of automatic fire protection systems, and that such automatic protection, especially coupled with physical separation, is not always feasible in operating plants. Prudence therefore dictates that manual firefighting capability be available throughout the plant to increase the overall reliability of fire suppression capability.

E. Hydrostatic Hose Tests

This item describes the frequency and severity of hydrostatic tests to which all plant fire hose must be subjected in order to have reasonable assurance that it will function properly without rupture when needed during a fire.

F. Automatic Fire Detection

This item requires automatic fire detection systems in areas containing combustibles and safe shutdown or safety-related systems or components, in order to provide prompt notification and alarm in the event

of fire in these areas. This will permit prompt response by the fire brigade to enable speedy extinguishment in those areas not protected by automatic fire suppression systems and may enable the brigade to control fires in areas that are so protected before the automatic systems operate.

G. Protection of Safe Shutdown Capability

A wide spectrum of fire hazards and shutdown equipment subject to fire damage exists in operating nuclear power plants. This item lists several parameters (the combination of fire hazards, the susceptibility of safe shutdown equipment to damage from both fire and fire suppression activities, fire suppression means available, and availability of alternate shutdown capability) that must be considered in evaluating the effectiveness of fire protection in areas containing safe shutdown equipment. Table 1 gives a summary of various conditions that mandate installation of manual or automatic fixed fire suppression systems.

H. Fire Brigade

The need for manual firefighting capability as backup to automatic fire detection and fixed fire suppression systems is established in Item D, which requires that a standpipe and hose system be installed to provide at least one effective hose stream in each area of the plant containing safety-related or safe shutdown equipment. This item specifies the minimum shift fire brigade size necessary to give reasonable assurance of effective manual firefighting capability. It requires that at least five persons be assigned to the fire brigade on each shift and that these persons have no duties during a fire except those directly related to manual firefighting. It further requires that the brigade leader and at least two brigade members be operations personnel, and that the brigade leader be competent to assess potential safety consequences of a

fire and advise control room personnel. It also states some of the equipment that is to be provided for the brigade members.

I. Fire Brigade Training

This item requires that training be provided for each individual brigade member and each shift brigade as a team in order to ensure the necessary high degree of proficiency required of a fire brigade during emergency response to an actual fire. The type and frequency of such training (classroom instruction, hands on practice sessions, and simulated drills) is specified.

J. Emergency Lighting

This item requires that emergency lighting from individual eight-hour battery-powered units be provided in those areas needed for operation of safe shutdown equipment and access routes to safety-related areas. Fire may damage normal lighting in areas other than the area of the fire. Such other areas may contain equipment or controls necessary for safe shutdown of the reactor. Emergency lighting is to be installed in all such areas in order to facilitate operation of such equipment by operations personnel other than the fire brigade in the event of loss of normal lighting due to fire.

K. Administrative Controls

The first goal of a fire protection program is fire prevention. Therefore, this item specifies a number of administrative controls in an effort to control the more common types of hazards. In addition, certain responses to fire by the plant fire brigade and other plant (operations) personnel are also specified.

L. Alternate Shutdown Systems

This item requires that an alternate means of bringing the reactor to a safe shutdown be provided if the provision of other fire

protection does not give assurance that safe shutdown capability will survive a fire.

M. Fire Barriers

This item discusses the need for fire barriers and the need to seal or close openings through fire barriers using fire doors, dampers, or penetration sealants depending on the type of opening. It discusses the need to close such openings in order to maintain the required fire resistance rating of the barrier.

N. Fire Barrier Penetration Seal Qualification

Openings are frequently required in fire barriers to permit passage of cable trays and conduits from one area to another. Such openings are degradations of the barrier and, per the requirements of Item M, are to be sealed with material that has fire retardant properties at least equal to that required of the unpierced barrier. This item describes the testing procedures that must be used to verify adequacy of a given penetration seal design.

O. Fire Doors

Personnel access openings in fire barriers require fire door closures with fire retardant properties at least equal to that required of the unpierced barrier. This item describes acceptable alternative methods to ensure that fire doors will be closed in the event of fire.

P. Reactor Coolant Pump Lubrication System

The lubrication system for the reactor coolant pumps represents the largest single fire hazard inside containment. This item describes the arrangement of automatic fire suppression or oil collection systems that are to be provided for protection of this hazard.

Q. Associated Circuits

This item specifies the level of fire protection to be provided for electrical circuits that are not themselves safety circuits but that are associated with safety circuits.

IV. Extent of Comment Period

The position of the staff and the licensees regarding the provisions of this rule is documented and well known. In addition, the public has been afforded several opportunities to comment on the provisions of the rule during two extensive comment periods and in open meetings with the ACRS in which a regulatory guide on fire protection was considered. For these reasons no extension of the comment period will be granted. Further, since the issues involved are well known and have been under discussion for several years, the Commission does not anticipate changes in the rule's action deadline as a result of further comments received.

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and section 553 of title 5 of the United States Code, notice is hereby given that adoption of the following amendments to 10 CFR Part 50 is contemplated.

PART 50 - DOMESTIC LICENSING OF  
PRODUCTION AND UTILIZATION FACILITIES

1. A new Section 50.48 is added to read as follows:

§ 50.48 Fire Protection.

(a) Each operating nuclear power facility shall have a fire protection plan which meets the requirements of Criterion 3 of Appendix A to this part. This fire protection plan should consist of two sections. The first section should describe the overall fire protection program

for the facility, identify the various positions within the licensee's organization that are responsible for the program, state the authorities that are delegated to each of these positions to implement those responsibilities, and outline the plans for fire protection, fire detection and suppression capability, and limitation of fire damage. The second section should describe specific features necessary to implement the first section, such as: administrative controls and personnel requirements for fire prevention and manual fire suppression activities; automatic and manually operated fire detection and suppression systems; and means to ensure capability to safely shutdown the plant in spite of fire damage to safety related or safe shutdown structures, systems or components.

(b) For nuclear power facilities that commenced operation prior to January 1, 1979, appropriate portions of Criterion 3 of Appendix A to this part will be satisfied by meeting the requirements contained in Appendix R to this part.<sup>3</sup>

(c) All fire protection modifications identified by the staff as necessary to satisfy criterion 3 of Appendix A to this part, whether contained in Appendix R to this part or in other staff fire protection guidance (except for alternate or dedicated shutdown capability) shall be completed by November 1, 1980 unless, for good cause shown, the Commission approves an extension. For alternate or dedicated shutdown capability, the following implementation schedule will apply.

<sup>3</sup>The combination of the guidance contained in Appendix A to Branch Technical Position 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976," as implemented by the staff in its plant-specific fire protection program reviews of operating nuclear power plants, and the requirements set forth in Appendix R to this Part define the minimum necessary conditions for demonstration of compliance with General Design Criterion 3 of Appendix A to this Part for nuclear power facilities that commenced operation prior to January 1, 1979.

- (i) Plants not included in the Systematic Evaluation Program (SEP):<sup>2</sup> Licensees implementing alternate shutdown capability shall complete implementation by April 1, 1981. Licensees who have previously committed to earlier implementation dates will be expected to meet the earlier dates. Licensees implementing dedicated shutdown capability shall complete implementation by December 1, 1981. Licensees shall submit, by August 1, 1980, plans and schedules for meeting these implementation deadlines.
- (ii) Plants included in the SEP: Licensees implementing alternate shutdown capability shall complete implementation by December 1, 1981; licensees implementing dedicated shutdown shall complete implementation by October 1, 1982. Licensees shall submit, by November 1, 1980, plans and schedules for meeting these implementation deadlines. The Commission may revise those implementation deadlines to earlier dates following completion by the NRC staff of its review of the status of fire protection at SEP plants. The staff review is expected to be completed in August, 1980.

2. A new Appendix R to 10 CFR Part 50 is added to read as follows:

APPENDIX R - FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES  
OPERATING PRIOR TO JANUARY 1, 1979

I. INTRODUCTION AND SCOPE

This Appendix sets forth the minimum fire protection requirements needed for nuclear power facilities to satisfy Criterion 3 of Appendix A

to this part with respect to certain recurring generic issues for nuclear power plants that were operating prior to January 1, 1979.<sup>3</sup>

This Appendix applies only to licensed commercial nuclear power electric generating stations operating prior to January 1, 1979; it does not apply to production reactors, test reactors, research reactors, or other licensed or unlicensed reactors used for other than electric power production.

This Appendix does not rescind any requirements set forth in any Safety Evaluation Report for any nuclear power facility.

## II. GENERAL REQUIREMENTS

### A. Fire Protection Program

A fire protection program shall be established at each plant. The program shall establish the fire protection policy for the protection of structures, systems, and components important to safety at each plant and the procedures, equipment, and personnel required to implement the program at the plant site.

The fire protection program shall be under the direction of an individual who has been delegated authority commensurate with the responsibilities of the position. The individual shall be knowledgeable in both fire protection and nuclear safety.

The fire protection program shall extend the concept of defense in depth to fire protection with the following objectives:

- to prevent fires from starting;
- to detect rapidly, control, and extinguish promptly those fires that do occur;

- to arrange the structures, systems, and components important to safety so that a fire that starts in spite of the fire prevention activities and that is not promptly extinguished by the fixed automatic or manual fire suppression activities will not prevent the safe shutdown of the plant.

The fire protection program shall consist of an integrated effort of procedures, equipment, and personnel necessary to carry out the three-part defense-in-depth concept for each fire area containing combustibles and containing or presenting a fire hazard to structures, systems, and components important to safety. Measures for fire prevention; fire detection, suppression, and containment; and alternate shutdown capability shall be provided for each such area as follows:

1. Fire Prevention

- a. In situ fire hazards shall be minimized by design and plant arrangement.
- b. Transient fire hazards associated with normal operation, maintenance, repair, or modification activities shall be identified and minimized. Those transient fire hazards that can not be eliminated shall be controlled.

2. Fire Detection, Suppression, and Containment

- a. Fire detection systems shall be installed.
- b. Portable extinguishers and standpipe and hose stations shall be installed.
- c. Manually actuated fixed suppression systems shall be installed where fire hazards of grouped electrical cables are large or access for the fire brigade is restricted.

- d. A site fire brigade shall be established, trained, and equipped.
- e. Automatic suppression systems shall be provided to control large fire hazards or to protect redundant systems or components important to safe shutdown.
- f. Fire retardants, heat shields, or local fire barriers shall be provided where physical separation between redundant safe shutdown systems and components or between such systems and fire hazards is not adequate to ensure that automatic and manual fire suppression can limit the fire damage to one division of shutdown systems.
- g. Fire barriers surrounding each fire area shall have a 3-hour fire rating unless the fire hazards analysis demonstrates that a lesser rating exceeds the duration of the in situ fire load by at least one-half hour.
- h. Fire detection and suppression systems shall be designed, installed, maintained and tested by personnel properly qualified by experience and training in fire protection systems.
- i. Surveillance procedures shall be established to ensure that fire barriers and automatic and manual fire suppression systems and components are operable.

### 3. Alternate Shutdown Capability

Alternate shutdown capability shall be provided when safe shutdown cannot be ensured by barriers and detection and suppression systems, because of the exposure of redundant safe shutdown equipment, cabling, or components in a single fire area to an exposure fire, fire suppression activities, or rupture or inadvertent operation of fire suppression systems.

B. Loss of Offsite Power

Fire detection and suppression systems protecting systems necessary to achieve and maintain safe plant shutdown shall be capable of functioning with or without offsite power.

C. Manual Fire Fighting

Manual fire fighting capability shall be provided in all areas containing or presenting a fire hazard to structures, systems, or components important to safety.

D. Access for Manual Fire Fighting

Access shall be provided to all areas containing or presenting a fire hazard to structures, systems, or components important to safety to permit effective functioning of the fire brigade.

E. Fire Hazard Analysis

The adequacy of fire protection for any particular plant area shall be determined by analysis of the effects of postulated exposure fires involving both in situ and transient combustibles on the ability to safely shut down the reactor, or the ability to minimize and control the release of radioactivity to the environment. Separation of redundant systems and components by three-hour rated fire barriers or at least 50 feet both horizontal and vertical of clear air space shall be deemed adequate. Lesser ratings or distances shall be justified by analysis or test.

III. SPECIFIC REQUIREMENTS

A. Fire Water Distribution System

An underground yard fire main loop shall distribute fire protection water from the fire water supplies to the automatic and manual suppression

systems. Two fresh water supplies shall be provided to furnish necessary water volume and pressure to the yard fire main loop. Each supply shall consist of a storage tank, pump, piping, and appropriate isolation and control valves. These supplies shall be separated so that a failure of one supply will not result in a failure of the other supply.

Two separate redundant suction from a large body of fresh water will satisfy the requirement for two separated water storage tanks.

Each supply of the fire water distribution system shall be capable of providing for a period of 2 hours the maximum expected water demands as determined by the fire hazards analysis for safety-related areas or other areas that present a fire exposure hazard to safety-related areas.

Minimum fire water storage shall be ensured by means of dedicated tanks or by means of a vertical standpipe for other water-service when storage tanks are used for combined service-water/fire-water uses.

Other water systems used as a fire water supply shall be permanently connected to the fire main system and shall be capable of automatic alignment to the fire main system. Pumps, controls, and power supplies in these systems shall satisfy the requirements for the main fire pumps. The use of other water systems for fire protection shall not be incompatible with their functions required for safe plant shutdown. Failure of the other system shall not degrade the fire main system.

B. Sectional Control Valves

Approved visually indicating sectional control valves such as Post Indicator Valves shall be provided to isolate portions of the fire main for maintenance or repair without shutting off the entire system.

C. Hydrant Block Valves

Block valves shall be installed in hydrant laterals if necessary to permit isolation of outside hydrants from the yard fire main without interrupting the fire water supply to any area containing or presenting a fire hazard to safety-related or safe shutdown equipment.

D. Manual Fire Suppression

Standpipe and hose systems shall be installed so that at least one effective hose stream will be able to reach any location that contains or could present an exposure fire hazard to safety-related equipment. Standpipe and hose stations shall be inside PWR containments and large BWR containments that are not inerted. For BWR dry wells, standpipe and hose stations shall be placed outside the dry well with adequate lengths of hose to reach any location inside the dry well with an effective hose stream.

E. Hydrostatic Hose Tests

Fire hose shall be hydrostatically tested at a pressure 50 psi above maximum service pressure. Hose stored in outside hose houses shall be tested annually. Interior standpipe hose shall be tested every three years.

F. Automatic Fire Detection

Automatic fire detection systems shall be installed in all areas of the plant that contain combustibles and safe shutdown or safety-related systems or components.

G. Protection of Safe Shutdown Capability

Protective features shall be provided for fire areas that contain cables or equipment of redundant systems important to achieving and

maintaining safe shutdown conditions to ensure that at least one means of achieving said conditions survives postulated fires. The protective features may consist of a combination of automatic and manual fire suppression capability, fire propagation retardants, physical separation, partial fire barriers, or alternate shutdown capability independent of the fire area.

1. The design of the protective features shall consider:
  - a. The zone of influence of postulated fires and the fire extinguishing system used in the fire area.
  - b. The access for manual firefighting.
  - c. The potential disabling effects of water on shutdown capability.
  - d. The limitations of fixed suppression systems.
  - e. The separation between redundant divisions.
  - f. The in situ and transient combustibles.
  - g. The propagation rate of fire in the configuration.
  - h. The availability of shutdown capability independent of the fire area.
  - i. That all organic cable insulation and jacket material is combustible.
  - j. That metal conduit, covered cable trays, or solid bottom cable trays retard fire propagation but do not by themselves serve as a fire barrier to prevent the loss of function of the cables.
  - k. That fire retardant coatings retard fire propagation but do not prevent organic cable insulation and jacket materials from burning.
  - l. That oxygen is available to support combustion.
  - m. The failure of automatic fire suppression systems.
  - n. That the response of the fire brigade may be delayed.



TABLE 1

## FIRE PROTECTION FEATURES FOR SAFE SHUTDOWN CAPABILITIES

Type Fire	Fire/Water Disables Normal Shutdown Capability	Shutdown from Control Room Available	Shutdown from Alternate Panel Required	Access for Manual Fire Fighting	Fixed Suppression Systems Required
IN-SITU	NO	YES	NO	GOOD POOR	NO YES - MANUAL
	YES	NO	YES <sup>1</sup>	GOOD POOR	YES - AUTOMATIC <sup>2</sup> YES - AUTOMATIC
EXPOSURE	NO	YES	NO	GOOD POOR	NO YES - MANUAL
	YES	NO	YES <sup>1</sup>	GOOD POOR	YES - AUTOMATIC <sup>2</sup> YES - AUTOMATIC

Note 1 - When the alternate shutdown capability is provided by an independent system dedicated to achieving and maintaining safe shutdown conditions, manually actuated fixed water systems or automatic gas suppression systems shall be provided for large concentrations of grouped electrical cables.

Note 2 - Requirement for fixed suppression may be waived if (a) only in-situ combustible is cable insulation, (b) measures are provided to retard propagation, and (c) separation between redundant systems is at least 10 feet horizontal and vertical of clear air space.

1. Personal protective equipment such as turnout coats, boots, gloves, hard hat, and pressure demand full-vision self-contained breathing apparatus with a minimum one-half hour rated capacity and approved by National Institute of Occupational Safety and Health (NIOSH) for firefighting purposes.
2. Manual suppression equipment such as portable extinguishers and standpipe and hose with nozzles suitable for the location.
3. Other systems and equipment necessary for efficient utilization of the brigade, such as emergency lighting in access routes to areas containing safety-related systems or components, and emergency communication capability throughout the plant that is independent of the normal communication systems. Emergency communication equipment shall not interfere with other plant equipment or controls.

I. Fire Brigade Training

The fire brigade training program shall ensure that the capability to fight potential fires is established and maintained. The program shall consist of an initial classroom instruction program followed by periodic classroom instruction, practice in firefighting, and fire drills:

1. Instruction

- a. The initial classroom instruction shall include:
  - (1) Indoctrination of the plant firefighting plan with specific coverage of each individual's responsibilities.

- (2) Identification of the fire hazards and associated types of fires that could occur in the plant and an identification of the location of such hazards.
- (3) The toxic characteristics of expected products of combustion.
- (4) Identification of the location of fire fighting equipment for each fire area and familiarization with the layout of the plant, including access and egress routes to each area.
- (5) The proper use of available fire fighting equipment and the correct method of fighting each type of fire. The types of fires covered should include electrical fires, fires in cables and cable trays, hydrogen fires, fires involving flammable and combustible liquids or hazardous process chemicals, construction fires, and record file fires.
- (6) The proper use of communication, lighting, ventilation, and emergency breathing equipment.
- (7) The proper method for fighting fires inside buildings and confined spaces.
- (8) The direction and coordination of the firefighting activities (fire brigade leaders only).

- (9) Detailed review of firefighting strategies and procedures.
- (10) Review of the latest plant modifications and corresponding changes in firefighting plans.

Note: Items (9) and (10) may be deleted from the training of non-operations personnel who may be assigned to the fire brigade.

- b. The instruction shall be provided by qualified individuals who are knowledgeable, experienced, and suitably trained in fighting the types of fires that could occur in the plant and in using the types of equipment available in the nuclear power plant.
- c. Instruction shall be provided to all fire brigade members and fire brigade leaders.
- d. Regular planned meetings shall be held at least every 3 months for all brigade members to review changes in the fire protection program and other subjects as necessary.
- e. Periodic refresher training sessions shall be held to repeat the classroom instruction program for all brigade members over a two year period. These sessions may be concurrent with the regular planned meetings.

2. Practice

Practice sessions shall be held for each shift fire brigade on the proper method of fighting the various types of fires

that could occur in a nuclear power plant. These sessions shall provide brigade members with experience in actual fire extinguishment and the use of emergency breathing apparatus under strenuous conditions encountered in fire-fighting. These practice sessions shall be provided at least once per year for each fire brigade member.

3. Drills

- a. Fire brigade drills shall be performed in the plant so that the fire brigade can practice as a team.
- b. Drills shall be performed at regular intervals not to exceed 3 months for each shift fire brigade. Each fire brigade member should participate in each drill, but must participate in at least two drills per year.

A sufficient number of these drills, but not less than one for each shift fire brigade per year, shall be unannounced to determine the firefighting readiness of the plant fire brigade, brigade leader, and fire protection systems and equipment. Persons planning and authorizing an unannounced drill shall assure that the responding shift fire brigade members are not aware of the time or location of the drill until it is begun.

At least one drill per year shall be performed on a "back shift" for each shift fire brigade.

- c. The drills shall be preplanned to establish the training objectives of the drill and shall be critiqued to determine how well the training objectives have been met. Unannounced drills shall be planned and critiqued by members of the management staff responsible for plant safety and security. Performance deficiencies of a fire brigade or of individual fire brigade members shall be remedied by scheduling additional training for the brigade or members. Unsatisfactory drill performance shall be followed by a repeat drill within 30 days.
  
- d. At 3 year intervals, drills shall be critiqued by qualified individuals independent of the licensee's staff. A copy of the written report from such individuals shall be submitted to NRC for evaluation.
  
- e. Drills shall as a minimum include the following:
  - (1) Assessment of fire alarm effectiveness, time required to notify and assemble fire brigade, and selection, placement and use of equipment, and firefighting strategies.
  
  - (2) Assessment of each brigade member's knowledge of his role in the firefighting strategy for the area assumed to contain the fire. Assessment of the brigade member's conformance with established plant firefighting procedures and

use of firefighting equipment, including self-contained emergency breathing apparatus, communication equipment, and ventilation equipment, to the extent practicable.

- (3) The simulated use of firefighting equipment required to cope with the situation and type of fire selected for the drill. The area and type of fire chosen for the drill should be varied such that brigade members are trained in fighting fires in all safety-related areas. The situation selected should simulate the size and arrangement of a fire which could reasonably occur in the area selected, allowing for fire development due to the time required to respond, to obtain equipment, and organize for the fire, assuming loss of automatic suppression capability.
- (4) Assessment of brigade leader's direction of the firefighting effort, as to thoroughness, accuracy, and effectiveness.

4. Records

Individual records of training provided to each fire brigade member, including drill critiques, shall be maintained for at least 4 years to ensure that each member receives training in all parts of the training program. These records of training shall be available for review. Retraining or

broadened training for fire fighting within buildings shall be scheduled for all those brigade members whose performance records show deficiencies.

**J. Emergency Lighting**

Emergency lighting shall be provided in all areas needed for operation of safe shut down equipment and in access routes to all safety-related areas and other areas presenting a fire hazard to safety-related areas. Such emergency lighting may be provided by the normal lighting if it is connected to an emergency bus and the fire hazard analysis shows that it will not be damaged by any fire. Otherwise permanently installed sealed beam or florescent units with individual 8-hour minimum battery power supply shall be provided.

**K. Administrative Controls**

Administrative controls shall be established to minimize fire hazards in areas containing structures, systems, and components important to safety. These controls shall establish procedures to:

1. Govern the handling and limitation of the use of ordinary combustible materials, combustible and flammable gases and liquids, high efficiency particulate air and charcoal filters, dry ion exchange resins, or other combustible supplies in safety-related areas.
2. Prohibit the storage of combustibles in safety-related areas or establish designated storage areas and fire protection therefor.

3. Govern the handling of and limit transient fire loads such as combustible and flammable liquids, wood and plastic products, or other combustible materials in buildings containing safety-related systems or equipment during maintenance, modification, or refueling operations.
4. Designate the onsite staff member responsible for the in-plant fire protection review of proposed work activities to identify potential transient fire hazards and specify required additional fire protection in the work activity procedure.
5. Govern the use of ignition sources by means of a flame permit system that controls welding, flame cutting, brazing, or soldering operations. A separate permit shall be issued for each area where work is to be done, and if work continues over more than one shift, the permit shall be valid for not more than 24 hours.
6. Govern the removal from the area of all waste, debris, scrap, oil spills, or other combustibles resulting from the work activity immediately following completion of the activity, or at the end of each work shift, whichever comes first.
7. Govern the periodic housekeeping inspections to ensure continued compliance with these administrative controls.
8. Govern the use of specific combustibles in safety-related areas. All wood used in safety-related areas during main-

tenance, modification, or refueling operations (such as lay-down blocks or scaffolding) shall be flame-retardant treated. Equipment or supplies (such as new fuel) shipped in untreated combustible packing containers may be unpacked in safety-related areas if required for valid operating reasons. However, all combustible materials shall be removed from the area immediately following the unpacking. Combustible material shall not be left unattended during lunch breaks, shift changes, or other similar periods. Loose combustible packing material such as wood or paper excelsior shall be placed in metal containers with tight-fitting self-closing metal covers.

9. Govern actions to be taken by individual discovering the fire, such as notification of control room, attempt to extinguish fire, and actuation of local fire suppression systems.
10. Govern actions to be taken by the control room operator to determine the need for brigade assistance upon report of a fire or receipt of alarm on control room annunciator panel, such as announcing location of fire over PA system, sounding fire alarms, and notifying the shift supervisor and the fire brigade leader of the type, size, and location of the fire.
11. Govern actions to be taken by the fire brigade after notification by the control room operator of a fire, such as

assembling in a designated location, receiving directions from the specific fire fighting fire brigade leader, and, discharging specific fire fighting responsibilities including selection and transportation of fire fighting equipment to fire location, selection of protective equipment, use of fire suppression systems operating instructions, and use of preplanned strategies for fighting fires in specific areas.

12. Define the strategies for fighting fires in all safety-related areas and areas presenting a hazard to safety-related equipment. These strategies shall designate:
  - a. Fire hazards in each area covered by the specific fire fighting procedures.
  - b. Fire extinguishants best suited for controlling the fires associated with the fire hazards in that area and the nearest location of these extinguishants.
  - c. Most favorable direction from which to attack a fire in each area, in view of the ventilation direction, access hallways, stairs, and doors that are most likely to be fire free, and the best station or elevation for fighting the fire. All access and egress routes that involve locked doors should be specifically identified in the procedure with the appropriate precautions and methods for access specified.
  - d. Plant systems that should be managed to reduce the damage potential during a local fire; location of

local and remote controls for such management (e.g., any hydraulic or electrical systems in the zone covered by the specific fire fighting procedure that could increase the hazards in the area because of overpressurization or electrical hazards).

- e. Vital heat-sensitive system components that need to be kept cool while fighting a local fire. Particularly hazardous combustibles should be designated to receive cooling.
- f. Organization of firefighting brigades and the assignment of special duties according to job title so that all fire fighting functions are covered by any complete shift personnel complement. These duties include command control of the brigade, transporting fire suppression and support equipment to the fire scenes, applying the extinguishant to the fire, communication with the control room, and coordination with outside fire departments.
- g. Radiological and toxic hazards in fire zones.
- h. Ventilation system operation that ensures desired plant pressure distribution when the ventilation flow is modified for fire containment or smoke clearing operations.
- i. Operations requiring control room and shift engineer coordination or authorization.

j. Instructions for plant operators and general plant personnel during fire.

L. Alternate Shutdown Capability

1. If the combination of fire protection features required for safe shutdown includes alternate shutdown capability independent of a specific fire area, the design for such alternate shutdown capability shall accommodate postfire conditions where offsite power is available and where offsite power is not available for 72 hours.

If there are several such areas, the combinations of systems that provide the shutdown capability may be unique for each critical area. However, the shutdown capability provided for each such area shall be able to achieve and maintain subcritical reactivity conditions in the reactor, maintain reactor coolant inventory, achieve and maintain hot standby<sup>5</sup> conditions for a PWR (hot shutdown<sup>5</sup> for a BWR) for at least 72 hours, achieve cold shutdown<sup>5</sup> conditions within 72 hours and maintain cold shutdown conditions thereafter. The reactor coolant system process variables shall be maintained within those predicted for a loss of normal ac power. The fission product boundary integrity shall not be affected; i.e., there shall be no fuel clad damage, rupture of any primary coolant boundary, or rupture of the containment boundary.

2. The performance goals for the shutdown functions shall be:

- a. The reactivity control function shall be capable of achieving and maintaining cold shutdown reactivity conditions.

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<sup>5</sup>As defined in the Standard Technical Specifications.

- b. The reactor coolant makeup function shall be capable of maintaining the reactor coolant level above the top of the core for BWRs and in the pressurizer for PWRs.
- c. The reactor heat removal function shall be capable of achieving and maintaining decay heat removal.
- d. The process monitoring function shall be capable of providing direct readings of the process variables necessary to perform and control the above functions.
- e. The supporting functions shall be capable of providing the process cooling, lubrication, etc., necessary to permit the operation of the equipment used for safe shutdown functions.

3. Various safety-related and non safety-related equipment and/or systems may be identified by the licensee and accepted by the staff to provide alternative means to achieve and maintain hot standby conditions (hot shut down for a BWR). The fire hazards analysis shall show that at least one means to achieve and maintain hot standby conditions (hot shut-down for a BWR) is undamaged by any fire anywhere in the plant. In addition, the equipment and systems comprising that means of hot standby or hot shut down condition shall be capable of maintaining such conditions for at least 72 hours if the equipment required to achieve and maintain cold shutdown is not available because of fire damage. They shall also be capable of being powered by both onsite and offsite electric power systems or by onsite power systems that are independent of the onsite and offsite electric power systems. The number of operating shift personnel,

exclusive of fire brigade members, required to operate the equipment and systems shall be onsite at all times.

4. The fire hazards analysis shall show that either (a) any equipment and/or systems necessary to achieve and maintain cold shut down conditions will not be damaged by any fire; or (b) that any equipment and/or systems necessary to achieve and maintain cold shutdown conditions that are damaged by fire can be repaired and cold shut down achieved within 72 hours. Materials for such repairs shall be readily available onsite and procedures shall be in effect to implement such repairs. Equipment and systems used prior to 72 hours after the fire shall be capable of being powered by both onsite and offsite electric power systems or by onsite power systems that are independent of the onsite and offsite electric power systems; equipment and systems used after 72 hours may be powered by offsite power.

These shutdown systems need not be designed to meet seismic Category I criteria or single failure criteria; or to cope with other plant accidents such as pipe breaks or stuck valves except where required for other reasons, e.g., because of interface with or impact on existing safety systems.

M. Fire Barriers

Fire barriers (floors, walls, ceilings, or other enclosures) separating fire areas, or equipment or components of redundant systems important to safe shutdown within an area, shall have a fire rating of 3 hours unless a lower rating is justified by the fire hazard analysis.

Structural steel forming a part of or supporting such fire barriers shall have fire resistance equivalent to that required of the

barrier. Such fire resistance shall be provided by protection equivalent to metal lath and plaster covering.

Penetrations in these fire barriers, including conduits, cable trays, and piping, shall be sealed or closed to provide fire resistance rating equivalent to that required of the barrier. Door openings shall be protected with doors, frames, and hardware that have been tested and approved by a nationally recognized testing laboratory to have a fire resistance rating equivalent to that required of the barrier.

Penetrations for ventilation systems shall be protected by a standard "fire door damper."

**N. Fire Barrier Penetration Seal Qualification**

Penetration seal designs shall be qualified by an independent testing laboratory in accordance with American Society for Testing Materials, ASTM E-119 and the following conditions:

1. The cables used in the test shall be of the same type of construction as those used in the facility.
2. The test arrangement shall be representative of the worst-case configuration of cable loading, cable tray arrangement, anchoring, and penetration fire barrier size and design. The test sample shall also be representative of the cable sizes in the facility. Testing of the penetration fire barrier in the floor configuration will qualify the fire stop for use in the wall configuration also.
3. Cables penetrating the fire barrier shall extend at least 3 feet on the unexposed side and at least 1 foot on the exposed side.

4. The fire barrier shall be tested in both directions unless the fire barrier is symmetrical.
5. The fire barrier shall be tested with a pressure differential across it (higher pressure on the exposed side) that is equivalent to the maximum pressure differential a fire barrier in the plant is expected to experience unless such pressure differentials are shown to have no effect on the performance of the penetration seal.
6. The temperature levels of the cable insulation, cable conductor, cable tray, conduit, and fire stop material shall be recorded for the unexposed side of the fire barrier.
7. As an alternative to the standard straight-stream hose test stipulated in Section 9.4 and 9.5 of ASTM E-119, either of the following tests may be used:
  - a. Two identical test specimens are exposed to the standard fire. After 1 hour, one specimen is subjected to the standard straight-stream hose test stipulated in ASTM E119, while the other continues to be exposed to the standard fire for the full 3 hours; or
  - b. The single test specimen, immediately after the 3-hour standard fire exposure, is subjected to a water fog test using a high-velocity fog nozzle having an included angle of spray no larger than 30° and supplied by a hose no smaller than 1½ inches at a pressure of at least

75 psig measured at the base of the nozzle for an application time of at least 2½ minutes per 100 sq ft of test specimen.

8. **Acceptance Criteria - The test is successful if:**

- a. The cable penetration fire barrier has withstood the fire endurance test without passage of flame or ignition of cables on the unexposed side for a period of 3 hours,
- b. The temperature levels recorded for the unexposed side are analyzed and demonstrate that the maximum temperature is sufficiently below the cable insulation ignition temperature, and
- c. The fire barrier remains intact and does not allow projection of water beyond the unexposed surface during the hose stream test.

0. **Fire Doors**

Fire doors shall be self-closing or provided with closing mechanisms and shall be inspected semiannually to verify that automatic hold-open, release, and closing mechanisms and latches are operable. Fire doors shall be kept closed unless provided with automatic hold-open, release, and closing mechanisms.

One of the following measures shall also be provided:

1. Fire doors shall be electrically supervised at a continuously manned location; or

2. Fire doors shall be locked closed and inspected weekly to verify that the doors are in the closed position; or
3. Fire doors shall be provided with automatic hold-open and release mechanisms and inspected daily to verify that doorways are free of obstructions; or
4. Fire doors shall be kept closed and inspected daily to verify that they are in the closed position.

The fire brigade commander shall have ready access to keys for any locked fire doors.

Areas protected by automatic total flooding gas suppression systems shall have electrically supervised self-closing fire doors.

P. Reactor Coolant Pump Lubrication System

The reactor coolant pump lubrication system shall be protected by either an oil collection system or an automatic fire suppression system.

Oil collection systems shall be capable of collecting lube oil from all potential pressurized and unpressurized leakage sites in the reactor coolant pumps' lube oil systems, and draining the oil to a vented closed container. A flame arrestor is required in the vent if the flash point characteristics of the oil present the hazard of fire flashback. Leakage points to be protected shall include lift pump and piping, overflow lines, lube oil cooler, oil fill and drain lines and plugs, flanged connections on oil lines and lube oil reservoirs where such features exist on the reactor coolant pumps. Leakage shall be collected and drained to a closed container that can hold the entire lube oil system inventory. The drain line shall be large enough to accommodate the largest potential oil leak.

To provide adequate protection for a design basis Safe Shutdown Earthquake (SSE), one of the following should be provided:

1. The lube oil system components whose failure could result in leakage should be designed to withstand an SSE without leakage and the dropping of oil collection system components during an SSE should not cause loss of operability of safety-related equipment; or
2. The oil collection system should be designed to withstand an SSE and continue to be able to collect and drain leakage that may occur during an SSE. In this case the oil collection system should be adequate to collect oil from any external lube oil piping not designed to withstand an SSE in addition to leakage from points identified above.

If an automatic fire suppression system is selected, either the automatic and manual fire suppression system or the lube oil system components whose failure could result in leakage should be designed to withstand the SSE.

Q. Associated Circuits

Associated circuits shall be electrically isolated from safety equipment so that hot shorts, open circuits, or shorts to ground in the associated circuit will not prevent operation of the safety equipment.

If associated circuits are not known to be so electrically isolated, they shall be considered safe shutdown circuits. The separation and barriers between trays and conduits containing associated circuits of one safe shutdown division and trays and conduits containing associated

circuits or safe shutdown cables from the redundant division shall be such that a postulated fire involving associated circuits will not prevent safe shutdown.<sup>6</sup>

All interested persons who desire to submit written comments or suggestions concerning the proposed rulemaking should send their comments to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch, on or before \_\_\_\_\_. Copies of comments received on the proposed amendments may be examined in the Commission's Public Document Room at 1717 H Street, N.W., Washington, D.C.

(Sec. 161b, Pub. Law 83-703, 68 Stat. 948; Sec. 201, Pub. Law 93-438, 88 Stat. 1242 (42 U.S.C. 2201(b), 5841).)

Dated at \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_ 198\_.

For the Nuclear Regulatory Commission.

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Samuel C. Chilk  
Secretary of the Commission

<sup>6</sup>An acceptable method of complying with this alternative would be to meet Regulatory Guide 1.75 position 4 related to associated circuits and IEEE 384-1974 (Section 4.5) where trays from redundant safety divisions are so protected that postulated fires affect trays from only one safety division.