



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

May 22, 1980

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

We are enclosing revised pages 1 through 14 and a new page 14a for the proposed rule on fire protection transmitted by our letter dated May 19, 1980.

Sincerely,

Darrell G. Eisenhut, Director
Division of Licensing

Enclosures:

1. Revised pages 1-14 and
new page 14a

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 . 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.

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."¹ The guidance contained in BTP 9.5-1 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.

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

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).² 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.

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

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 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.

(SEPARATE COMMENTS OF COMMISSIONERS HENDRIE AND KENNEDY)

(We agree with the fire safety provisions of the proposed Appendix R to 10 CFR Part 50. However, we do not agree with the implementation schedule that the Commission proposes. In its original presentation of this rule to the Commission, the staff proposed a schedule which we believe is more reasonable.

(In the absence of Three Mile Island and the actions we have required, the short schedule the Commission proposes might be appropriate in view of the extended period during which a number of these fire safety provisions have been under discussion. In the present situation, the Commission has properly imposed a large number of Three Mile Island-related safety requirements on operating nuclear power plants. We are concerned that the short implementation schedule proposed here for fire safety provisions, together with the large workload associated with the Three Mile Island requirements, may make it impossible for licensees to complete all of these measures in a carefully considered and thorough fashion.

Since all operating plants have implemented a number of improvements in their fire safety postures, the remaining improvements to be required under the proposed rule do not seem to us so urgent as to require either shutting down of plants because of inability to complete these requirements on the short schedule proposed or to make those improvements in a hasty fashion.

(We note also that the proposed implementation schedule would require licensees to submit their plans for complying with this rule by August 1, 1980. Considering that the staff has said it will not be able to complete its plant-by-plant reviews to determine specific requirements until July 1980, some licensees will simply not have any reasonable time to make an adequate plan.)

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.