From: Raji Tripathi
To: WND2.WNP4.DBM
Date: 4/2/98 11:01am
Subject: CRGR ENDORSEMENT

TO: D. Matthews, NRR

On March 13, 1998, at the CRGR Meeting No. 317, the Committee reviewed the draft Reg. Guide DG-1069, "Fire Protection Program for Nuclear Power Plants During permanent Shutdown and Decommissioning." The Committee made various comments and recommended that resolution of one particular comment regarding applicability of 10 CFR Part 100, be submitted to the CRGR staff for review. The Committee did not wish to review the revised text.

The cognizant staff submitted the revised document to the CRGR staff on the 26th of March. On the 27th, the CRGR staff requested that the staff confirm that the revised wording had a Branch-level (preferably at the Division-Director-level) consensus, as required by the CRGR procedures. However, to date, no formal confirmation has been received from the staff.

Based on the minor editorial changes suggested by the CRGR staff and in consultation with the Committee member who raised the aforementioned specific issue, and with the assumption that the revised text does have the Division-level consensus, the CRGR has no objection to the issuance of this Reg. Guide for public comments, subject to minor changes to the second paragraph on page 3 of the revised text; the attached file contains an excerpt of the paragraph. The CRGR meeting minutes will include as an attachment the revised Reg. Guide with these changes as noted.

This e-mail relays the formal CRGR endorsement.

Raji Tripathi (415-7584)

cc: CRGR members (S. Shankman for W. Kane)

CC: WND2.WNP4.LHT, WND2.WNP4.MTM2, TWD2.TWP0.DFR, TTM,...

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MEETING317 PDR

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REGULATORY RESEARCH

DRAFT REGULATORY GUIDE

January 1998
Division 1
Draft DG-1069

Contact: L. H. Thonus (717)948-1161

DRAFT REGULATORY GUIDE DG-1069

FIRE PROTECTION PROGRAM FOR NUCLEAR POWER PLANTS DURING DECOMMISSIONING AND PERMANENT SHUTDOWN

A. INTRODUCTION

On July 29, 1996, the Nuclear Regulatory Commission (NRC) amended its regulations on the decommissioning of nuclear power reactors by amending Part 50, "Domestic Licensing of Production and Utilization Facilities," of Title 10 of the Code of Federal Regulations (61 FR 39278). These changes included an amendment to 10 CFR 50.48, "Fire Protection," which added paragraph 50.48(f).

Paragraph 50.48(f) provides for fire protection programs for nuclear power plant licensees that have submitted the necessary certifications required by the amended 10 CFR 50.82, "Termination of License." Paragraph 50.48(f) requires the licensee of a permanently shutdown nuclear power plant to maintain a fire protection program to address the potential for fires that could result in the release or spread of radioactive materials. The objectives of the fire protection program are to (1) reasonably prevent fires from occurring, (2) rapidly detect, control, and extinguish those fires that do occur, and (3) minimize the risk of fire-induced radiological hazards to the public, the environment, and plant personnel.

This regulatory guide is being issued in draft form to involve the public in the early stages of the development of a regulatory position in this area. It has not received complete staff review and does not represent an official NRC staff position.

Public comments are being solicited on the draft guide (including any implementation schedule) and its associated regulatory analysis or value/impact statement. Comments should be accompanied by appropriate supporting data. Written comments may be submitted to the Rules and Directives Branch, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555. Copies of comments received may be examined at the NRC Public Document Room, 2120 L Street NW., Washington, DC. Comments will be most helpful if received by

Requests for single copies of draft or active regulatory guides (which may be reproduced) or for placement on an automatic distribution list for single copies of future draft guides in specific divisions should be made in writing to the U.S. Nuclear Regulatory Commission, Washington, DC 20555, Attention: Printing, Graphics and Distribution Branch, or by fax to (301)415-5272.

This guide is applicable to fire protection programs for licensees that have certified, in accordance with 10 CFR 50.82(a)(1), that the plant has permanently ceased operations and the fuel has been permanently removed from the reactor vessel. This guide is being developed to describe methods acceptable to the NRC staff for complying with the NRC's regulations regarding fire protection programs for these licensees. This guide does not apply to the fire protection requirements of independent spent fuel storage installations (ISFSIs) that are licensed in accordance with the requirements of 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste," with the exception that the fire exposure risk to the ISFSI from the reactor undergoing decommissioning should be addressed.

A licensee may develop a performance-based fire protection program to meet the requirements of 10 CFR 50.48(f). The performance goals and measures established by the licensee should be founded on established industry standards and practices and should provide reasonable assurance that the fire protection objectives of 10 CFR 50.48 will be met. If a licensee chooses to use fire protection methods different from the guidelines recommended in this guide, the licensee should provide an equivalent level of fire protection. The licensee is responsible for demonstrating the equivalency of proposed alternative methods.

Appendix A to this guide is a glossary of terms that have been used in this guide. These definitions have been taken from existing regulatory documents and industry fire protection standards where possible. If published definitions were not available, definitions have been developed as necessary for use with this guidance. Appendix B to this guide provides examples of the level of fire protection that are acceptable to the NRC staff for spent fuel areas.

Regulatory guides are issued to describe and make available to the public such information as methods acceptable to the NRC staff for implementing specific parts of the Commission's regulations, techniques used by the staff in evaluating specific problems or postulated accidents, and guidance to applicants. Regulatory guides are not substitutes for regulations, and compliance with regulatory guides is not required. Regulatory guides are issued in draft form for public comment to involve the public in the early stages of developing the regulatory positions. Draft regulatory guides have not received complete staff review and do not represent official NRC staff positions.

The information collections contained in this draft regulatory guide are covered by the requirements of 10 CFR Part 50, which were approved by the Office of Management and Budget, approval number 3150-0011. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

B. DISCUSSION

GENERAL

The fire protection requirements for operating reactors are provided by General Design Criterion (GDC) 3 of Appendix A to 10 CFR Part 50, 10 CFR 50.48, and Appendix R to 10 CFR Part 50. Before the decommissioning rule was published on July 29, 1996, the NRC's fire protection regulations did not address nuclear power plants that have permanently ceased operations and are in the process of decommissioning.

The primary objective of the fire protection program for operating reactors is to minimize fire damage to structures, systems, and components (SSCs) important to safety, to ensure the capability to safely shut down the reactor and maintain it in a safe shutdown condition. For an initial period following shutdown accidents which can challenge the 10 CFR Part 100 limits remain credible and the fire protection program should continue to provide protection against these events. ~~For plants that have permanently ceased operations and have removed fuel from the reactor vessel, the safe shutdown requirements of 10 CFR 50.48 and of Appendix R to 10 CFR Part 50 are no longer applicable.~~ After a period of radionuclide decay and reduction in heat load, a determination can be made that the maximum credible accidents do not require offsite emergency protective actions. After that determination has been made, the primary fire protection concern for permanently shutdown plants is protecting the integrity of the spent fuel and preventing or minimizing the release of radioactive materials resulting from fires involving contaminated plant SSCs or radioactive wastes. The radiation dose limits specified in 10 CFR Part 20, "Standards for Protection Against Radiation," apply to plant personnel and members of the public for fire incidents at permanently shutdown nuclear power plants. Licensees should make every effort to maintain exposures to radiation resulting from a fire as low as reasonably achievable.

The fire protection program for the operating reactor provides the basis for developing the fire protection program for the decommissioning phase. The goal of the fire protection program during decommissioning of nuclear power plants is to provide an appropriate level of defense-in-depth protection against the threat of fires. Defense-in-depth, relative to fire protection, involves a comprehensive program of administrative controls, physical fire protection features, emergency response capabilities, and protection of SSCs necessary to prevent or mitigate the potential release of radioactive materials. This combination of fire protection elements acts to reduce both the probability and consequences of fire events, and it provides assurance that the failure of any one element within the fire protection program is adequately compensated for by the others, thereby minimizing the risks to the public, environment, and plant personnel.

Licensees that have permanently shut down their nuclear power plants, and have made the necessary decommissioning submittals to the NRC as required by 10 CFR 50.82, may either immediately begin decommissioning and dismantlement of the facility or may choose to place the facility in a monitored storage condition for some period of time prior to commencing with final decommissioning and dismantlement activities. The fire protection requirements may be considerably different depending on the licensee's selected approach to decommissioning.

In general, the processes and activities associated with nuclear plant decommissioning can be dynamic, with plant conditions and configurations continuously changing. Decommissioning activities may increase fire hazards in the plant through mechanisms that include, but are not limited to, increased hot work (e.g., welding, cutting, grinding), increases in combustible loading, erection of temporary structures to support decommissioning or dismantlement of the plant, and deactivation or abandonment of plant systems. In addition to the physical changes to the plant, the licensee's organizational structure and responsibilities are expected to be different during decommissioning, with staffing levels significantly lower than during plant operations. The licensee is likely to rely heavily on contractors to perform much of the decommissioning and dismantlement of the plant.

C. REGULATORY POSITION

1. FIRE PROTECTION PROGRAM

1.1 Objectives

This regulatory guide describes a fire protection program for permanently shutdown nuclear power plants that is acceptable to the NRC staff for meeting the requirements of 10 CFR 50.48(f), regarding fire protection for permanently shutdown nuclear power plants. Because of the dynamics of the decommissioning process, the licensee's fire protection program should be re-evaluated and revised as necessary to reflect the facility condition through the various stages of decommissioning in accordance with this regulatory guide. The fire protection program should address the following performance objectives.

- **Prevent fires from occurring**. Administrative controls and, where possible, physical features (e.g., barriers or other physical separation of combustibles from ignition sources) should be implemented that provide reasonable assurance that fires will not occur.

- **Rapidly detect, control, and extinguish fires that do occur**. Appropriate levels of fire protection, including detection systems, automatic or manual fire suppression systems, water supplies, and emergency response capability, should be provided based on the fire hazards present.

- **Minimize the risk to the public, environment, and plant personnel resulting from fires that could result in a release of radioactive materials**. Plant SSCs important to the prevention or mitigation of fire-induced releases of radioactive materials should be provided with the appropriate level of fire protection. Plant personnel should be adequately trained in emergency response procedures for fire events.

1.2 Fire Protection Program Standards

The fire protection program for decommissioning should be based on sound engineering practices and established industry standards such as those provided by the National Fire Protection Association (NFPA). This regulatory guide endorses several standards as guidance for implementing various elements of the fire protection program. The citation or reference of these standards in this guide is for guidance and does not imply NRC requirements.

Deviations from industry codes and standards should be justified on a case-by-case basis. The cited standards should be applied in a manner consistent with the NRC's regulations. An individual plant's standards-of-record are generally established in the operating plant's fire protection program and will also be considered to apply to the decommissioning fire protection program as appropriate.

1.3 Transition from Operating Plant Program

Operating plants are required to have a fire protection program in accordance with the requirements of 10 CFR 50.48 and General Design Criterion 3, "Fire Protection," of Appendix A to 10 CFR Part 50. The primary objective of the operating plant fire protection program is to provide defense-in-depth protection of the capability to shut down the reactor and maintain it in a safe shutdown condition. The safe shutdown objective is not applicable during decommissioning, with the reactor permanently shut down and the fuel removed from the reactor vessel. However, many of the elements of the operating plant fire protection program continue to be applicable under plant decommissioning. The operating plant fire protection program provides the baseline analysis and description of plant fire hazards, administrative controls, physical protection features, and emergency response capabilities. Many of these elements will be carried over to the fire protection program for decommissioning.

1.4 Fire Protection Program for Decommissioning

The fire protection program is expected to change throughout the various phases of decommissioning. Initially, with spent fuel removed from the reactor and stored in the spent fuel pool, it is appropriate to develop and maintain a comprehensive decommissioning fire protection program to provide assurance that the probability of fires affecting the spent fuel or other radiological hazards is minimized, and that the consequences of fires, should they occur, are adequately mitigated. As decommissioning progresses and the spent fuel is moved to an independent storage facility or permanent repository, the fire protection requirements for the plant may be scaled down in accordance with the diminishing radiological hazard. However, even in the absence of spent fuel in the spent fuel pool, a fire protection program should be maintained that ensures adequate protection from the fire-induced release of radioactive material from contaminated plant areas and combustible wastes.

The decommissioning fire protection program described in this regulatory guide is limited to decommissioning activities associated with the radiological hazards present in the plant or in the ancillary facilities (e.g., onsite waste storage) that directly support the decommissioning process. This guide does not provide guidance on fire protection for ISFSIs. The fire protection for plant areas that are considered to have property loss concerns only would be determined solely by the licensee.

The licensee should maintain a fire protection program as long as there are radiological hazards on the site, or until the license is terminated and the site is released for restricted or unrestricted use.

Subject to the requirements of 10 CFR 50.48(f)(3), a licensee may make changes to the fire protection program without prior NRC approval provided the changes do not reduce the effectiveness of fire protection for facilities, systems, and equipment that could result in a radiological hazard, taking into account the p' 't conditions and activities during decommissioning.

2. FIRE HAZARDS ANALYSIS

The fire hazards analysis provides a comprehensive evaluation of the facility's fire hazards, the fire protection capability relative to the identified hazards, and the ability to protect spent fuel and other radioactive materials from potential fire-induced releases. The fire hazards analysis in place for plant operation may be used as the baseline, but it should be re-evaluated and revised as necessary to reflect the unique or different fire protection issues and strategies associated with decommissioning. At a minimum, the fire hazards analysis should address the following items.

2.1 Fire Hazards

The fire hazards should be specifically identified, typically on a fire area basis. The fire hazards for a plant undergoing decommissioning may be significantly different from those for an operating plant, and they may change as decommissioning progresses. The fire hazards analysis should consider the potential for increased combustible loading from sources such as equipment lay-down areas, waste accumulation and storage areas, and materials necessary to support decontamination and dismantlement activities. Hot work involving the use of open

flame or sparks is also likely to increase during decommissioning. Other fire hazards may include temporary structures and support systems (e.g., electrical, heating, and ventilation) that may impact the fire hazards in the plant.

2.2 Physical Plant Configuration and Condition

The fire hazards analysis should describe the layout, configuration, and condition of the plant fire areas and should be updated to reflect any changes that occur through the various decommissioning phases. Dismantlement of or modifications to facility structures and the deactivation, modification, or removal of plant systems may impact fire protection program elements.

2.3 Fire Protection Elements

The fire hazards analysis should describe the administrative controls, fire detection and suppression systems, smoke exhaust systems, fire barriers, and any other pertinent elements of the administrative and physical fire protection program that are applicable to protecting against the identified fire hazards.

2.4 Radiological Hazards and Systems Important to Safety

The fire hazards analysis should identify the radiological hazards by fire area and identify the SSCs necessary to prevent or mitigate the release of radioactive materials in the event of a fire, such as the plant ventilation systems. Consideration should be given to the control of runoff resulting from fire suppression activities in areas containing radioactive materials. The onsite and offsite radicactive releases expected from a fire should be quantified or referenced in the fire hazards analysis and compared to the dose acceptance criteria in 10 CFR Part 20.

As decommissioning progresses, the radiological hazards may change as areas and structures are decontaminated, contaminated components are removed, the spent fuel storage configuration is changed (e.g., from pool to dry cask or removal to an ISFSI), and contaminated waste accumulates (before being transported to an offsite storage facility). System configurations and requirements may also change based on changing hazards and the

general progression of decommissioning activities, and these changes should be reflected in the analysis.

2.4.1 Spent Fuel

The SSCs necessary to protect the spent fuel should be identified and may include the spent fuel storage enclosure and pool, spent fuel pool cooling and makeup systems and any necessary support systems, such as instrumentation and control, ventilation, and electrical power. The fire hazards analysis should describe the fire threats and the associated protection measures provided for the spent fuel, and any associated SSCs that are important to maintaining spent fuel integrity. Appendix B to this guide provides examples of the level of fire protection acceptable to the NRC staff for spent fuel areas.

2.4.2 Contaminated Plant Areas and Waste Storage

The fire hazards analysis should identify areas of the plant that contain significant radioactive contamination that might be released or spread by the effects of a fire. As the plant is decontaminated and dismantled, contaminated waste (including combustible and potentially contaminated plant equipment, such as electrical cables) may accumulate. The fire hazards analysis should provide an assessment of the potential for this material to be involved in a fire and of the protective measures provided to minimize the potential for fire-induced releases or spread of radioactive material. Appendix B to this guide contains an example of the level of fire protection acceptable to the staff for radioactive waste storage areas.

2.5 Exposure Risks from Co-Located Facilities

The fire hazards analysis should evaluate the risks to exposure from fires at co-located or nearby facilities. Consideration should be given to the effects of a fire on shared systems for multi-unit sites and to the potential for fires to propagate from one facility to the other.

Decommissioning may require erecting temporary onsite structures for the storage of radioactive and other wastes generated by the decommissioning and dismantlement activities. The fire hazards associated with fires in these facilities should be analyzed in conjunction with the potential for such fires to propagate to other plant areas and result in radiological releases.

3. ADMINISTRATIVE CONTROLS

Administrative controls involve the policies, procedures, and practices that govern the performance or execution of fire protection program activities necessary to ensure that the fire protection objectives are met. These controls establish the necessary fire prevention measures and contain the requirements for maintenance, testing, inspection, and availability of physical fire protection features (e.g., barriers, detection, and suppression); organizational responsibilities; and the training or qualification requirements for general employees, emergency responders, and licensee contractors.

3.1 Organization

Licensees' decommissioning organizations are likely to be significantly smaller than those necessary for an operating plant. The fire protection program should identify and clearly establish the organizational responsibilities for management and implementation of the fire protection program. The fire protection responsibilities of licensee contractors should also be established.

Organizations or positions responsible for the following fire protection activities should be identified:

- Management of the overall fire protection program.

- Development, maintenance, updating, and verification of compliance of the fire protection program.

- Implementation of fire protection program requirements, including policies and procedures, training, fire protection system controls, system inspection, testing, maintenance and design, control of combustibles, and hot work.

- The leadership, staffing, and training of the emergency response team (e.g., fire brigade) and agreements with offsite responders.

The organizations responsible for implementing the fire protection program should include an individual or individuals, adequately qualified in nuclear safety and fire protection engineering, who will ensure that the fire protection program is implemented in accordance with applicable industry standards and NRC regulations.

3.2 Fire Protection Procedures

Implementing procedures for the fire protection program should be provided that formally establish the organizational responsibilities and administrative practices of the fire protection program.

Emergency procedures should be provided that describe emergency response actions, including the operational actions (e.g., ventilation system line-ups and operational requirements) that are necessary to mitigate the consequences of fires. Fire pre-plans should identify the fire fighting strategy to be employed based on the fire location and the hazards involved. Coordination with offsite responders and the fire response leadership and command structure for both the onsite fire brigade and offsite responders should be explained.

The activities associated with decommissioning and dismantling a plant result in constantly changing hazards. Maintaining adequate fire protection and safety in this changing environment requires constant vigilance on the part of the fire protection staff, plant personnel, and decommissioning contractors. For this reason, the fire protection program should be integrated with the work control processes and should provide for proper review and authorization of work activities involving fire hazards or fire system maintenance, testing, impairments or deactivation.

3.3 Training

Training is necessary to ensure that the licensee's employees, contractors, and emergency responders have the necessary knowledge and skills to properly execute their responsibilities regarding the fire protection program.

3.3.1 General

Plant personnel and contractor employees should be informed of the proper procedures for reporting a fire, responding to plant fire alarms, preventing fires at the plant, locating and

using fire extinguishers, as well as the hazards of incipient stage fire fighting. Personnel who are designated to use a fire extinguisher as part of an emergency action plan should receive training in the appropriate use of the available equipment. Additional guidance and information is provided in NFPA 1, "Fire Prevention Code."

3.3.2 Fire Watch

Fire watch personnel for buildings and hot work operations should be informed of the specific duties and responsibilities they are expected to fulfill. Fire watch personnel should be trained in the use of fire extinguishers, including practice on training fires. Additional information and guidance is contained in Chapter 34, "Welding, Cutting, and Use of Torches," and Chapter 41, "Safeguarding Building Construction and Demolition Operations," of NFPA 1 and in Chapter 3, "Fire Prevention Precautions," of NFPA 51B, "Standard for Fire Prevention in Use of Cutting and Welding Processes."

3.3.3 Fire Brigade and Offsite Support

Plant personnel who are assigned manual fire fighting responsibilities should receive training commensurate with their responsibilities. Fire brigade members and responding offsite emergency services personnel should receive training on facility layout, fire hazards, fire pre-plans, fire fighting equipment, radiation hazards, and health physics as pertains to fire fighting operations. Periodic drills should be conducted to determine the readiness and capability of fire brigade personnel and offsite responders. The plant training program should be detailed in writing, and written records of all plant fire brigade training should be maintained. Fire protection standards NFPA 600, "Standard on Industrial Fire Brigades," NFPA 801, "Standard for Facilities Handling Radioactive Materials," and NFPA 1500, "Fire Department Occupational Safety and Health Program," provide information and guidance on training for fire suppression personnel.

3.4 Control of Combustible Materials

Combustible materials, including flammable and combustible liquids, compressed gases, construction materials, and refuse, should be used, stored or disposed of in a manner that minimizes the occurrence of fire. Chapter 3-11, "Combustible Waste and Refuse," and Part V, "Special Processes and Material Handling," of NFPA 1 and Chapter 3, "Processes and

Hazards," of NFPA 241, "Standard for Safeguarding Construction, Alteration, and Demolition Operations," provide information and guidance regarding the control of combustible materials. NFPA 30, "Flammable and Combustible Liquids Code," and NFPA 55, "Use and Handling of Compressed and Liquefied Gases in Portable Cylinders," provide information and guidance for the handling, storage, and use of flammable and combustible liquids and gases.

3.4.1 Transient Combustibles

Transient fire hazards associated with decommissioning activities should be minimized to the extent possible, and they should be removed promptly upon completion of the activities. The following are specifics regarding control of transient combustible materials that should be considered.

- Transient combustible materials should be limited in quantity to actual need and should be separated from ignition sources. Accumulation and storage of combustible wastes should be minimized.
- Wood should not be used for permanent applications in plant areas with a potential for a radiological release. The use of wood for temporary purposes should be minimized, and if used, the wood should be listed or approved pressure-impregnated fire-retardant lumber.

- The use of plastic sheeting should be minimized, and if used, the plastic sheeting should be fire retardant. NFPA 701, "Standard Methods of Fire Tests for Flame-Resistant Textiles and Films," provides additional guidance.

- Combustible waste materials that are radioactively contaminated or that present a fire risk to radioactive material should be handled, packaged, and stored in a manner that minimizes the threat of fire; such waste materials should be protected by an active fire suppression system.

- Oily rags and materials susceptible to spontaneous ignition should be stored in a listed or approved disposal container and should be removed on a daily basis from areas containing radioactive materials or contamination.

- Good housekeeping practices should be maintained with particular attention to areas containing radioactive materials or contaminated waste and equipment. Accumulations of combustible material, including waste and debris, should be removed from the work location at the end of each shift. Spills of combustible or flammable liquids should be contained and cleaned up immediately, with appropriate consideration for the safety of personnel. The cleaning materials and waste should be removed from the area daily and disposed of appropriately. General housekeeping practices should be implemented to remove trash and clutter and to maintain clear access and egress routes throughout the plant.

3.4.2 Storage of Flammable and Combustible Liquids and Gases

Flammable and combustible liquids and flammable compressed gases should be stored where they do not present a fire risk to areas containing radioactive materials, contamination, or SSCs important to the prevention or mitigation of radioactive material releases. Refer to NFPA 30 and NFPA 55 for additional information and guidance.

Smoking and working with open flame should not be permitted in areas used for the storage of flammable and combustible liquids or compressed gases.

3.5 Control of Ignition Sources

3.5.1 Control of Hot Work

Cutting, welding, grinding, and work involving open flame should be controlled so that it does not present an undue risk of fire. Chapter 34, "Welding, Cutting, and Use of Torches," of NFPA 1; NFPA 51B; and NFPA 241 provide information and guidance for minimizing the risk of fires resulting from hot work. A qualified fire watch should be provided during the hot work activity and for at least one-half hour after completion of the hot work operation.

3.5.2 Control of Temporary or Portable Heat-Producing Equipment

The fire protection program should identify the measures necessary to prevent portable heat-producing equipment from causing a fire. Listed or approved heat-producing equipment should be used. Temporary heating devices should be secured to prevent tip-over, and separated from combustible materials, equipment, and construction in accordance with their

listing or approval. For fuel-fired heating, the fuel storage, transfer and refueling systems, and operations should be in accordance with applicable NFPA standards. The use of portable heat-producing equipment should be controlled in areas with radiological hazards or significant combustible material that presents an exposure hazard to radioactive materials or systems important to safety. Additional guidance and information is contained in Chapter 41 of NFPA 1 and in Chapter 3 of NFPA 241.

3.5.3 Control of Smoking

Smoking should be permitted only in designated areas. Where smoking is permitted, safe receptacles for smoking materials should be provided. Smoking should be prohibited in other areas of the plant, specifically in the vicinity of hazardous operations or combustible/flammable materials. "No Smoking" signs should be posted in these areas.

3.6 Control of Fire Protection Systems and Equipment

3.6.1 Control of Fire Protection Equipment

Personnel protective equipment for fire brigades, including turnout gear and self-contained breathing apparatus, should regularly be inventoried, inspected, tested, and maintained to ensure proper performance.

Manual fire fighting equipment, including extinguishers, hoses, nozzles, tools, fittings, portable lighting, communications, and ventilation devices, should regularly be inventoried, inspected, tested, and maintained to ensure proper operation in the event of a fire.

3.6.2 Fire Protection System Operability, Inspection, Testing, and Maintenance

A program for inspection, testing, and maintenance should be provided to verify the operability of installed fire protection systems. Fire protection systems include passive fire protection systems such as fire barrier components and fire barrier seals as well as active fire protection systems such as fire alarm systems, fire suppression systems, and fire water supply systems. The program for inspection, testing, and maintenance should be based on the criteria specified in industry codes and standards, such as those published by the NFPA. Inspection, testing, and maintenance should be documented by means of written procedures, with results and follow-up actions recorded.

Personnel performing inspection, testing, and maintenance of installed fire protection systems should be trained and qualified for the type of system to which they are assigned.

3.6.3 Control of Fire Protection System Outages and Impairments

The fire protection program should provide the necessary controls to minimize the duration and impact of impairments to the fire protection system. Additional guidance and information is provided in Chapter 11, "Impairments," of NFPA 25, "Standard for the Inspections, Testing, and Maintenance of Water-Based Fire Protection Systems." The controls should provide for identifying, prioritizing, and timely correcting fire protection impairments, informing fire protection staff of the impairment, and establishing compensatory measures for the duration of the impairment. Compensatory measures may include, but are not limited to, fire watch tours of affected areas, limiting work activities involving fire hazards, providing alternative fire protection features, and requesting special fire department support.

Decommissioning work control practices should avoid scheduling activities that involve hot work, the use of flammable or combustible materials, or other fire hazards in areas with impaired fire protection systems (see Regulatory Position 3.2.2).

3.6.4 Control of Fire Area Boundaries or Barriers

The fire protection program should address the control of fire area boundaries or barriers, including the maintenance of these structures as the facility is modified or dismantled during decommissioning. Breaches in the fire barriers, caused by the removal of penetration seals or other modifications, should be protected in accordance with the modified barrier's fire resistance capability and the associated fire hazards. A program for inspecting, testing, and maintaining fire doors, fire dampers, and fire walls or separations should be developed and implemented to ensure these devices will perform as intended. The barrier control program should allow for redesignation, modification, or removal of barriers, based on changes to the facility and hazard (i.e., fire and radiological) configuration as the facility is decommissioned. NFPA 221, "Standard for Fire Walls and Fire Barrier Walls," contains additional information and guidance.

3.7 Control of Structures, Enclosures, and External Areas

3.7.1 Control of Temporary Enclosures and Structures

The fire protection program should address fire hazards created by the construction and location of temporary enclosures and structures. The fire protection program should evaluate the need for automatic or manual fire suppression capability within, and external to, each temporary structure. The use of combustible construction materials should be minimized and controlled in accordance with Regulatory Position 3.4, "Control of Combustible Materials," of this guide. Chapter 2, "Temporary Construction, Equipment and Storage," of NFPA 241 provides additional information and guidance for controlling the fire hazards associated with temporary structures.

Temporary structures should not present a fire exposure hazard to plant structures containing radioactive materials or radioactive contamination, or to contaminated waste material accumulation or storage areas. NFPA 80A, "Recommended Practice for Protection of Buildings from Exterior Fire Exposures," provides guidance for the appropriate separation of structures to minimize the fire exposure.

Tents or other membrane-type structures should be constructed of noncombustible material or approved fire retardant material. Membrane-type materials should be certified as conforming to the requirements of the large-scale test contained in NFPA 701.

3.7.2 Preventing Fire from Exposing Structures and Materials

The fire protection program should identify controls to protect structures containing radioactive materials from an exposure fire. The fire hazard presented by transient combustibles, including stored materials, debris, vegetation, and nearby or co-located structures, should be considered. Additional information can be found in NFPA 80A.

4. PHYSICAL FIRE PROTECTION FEATURES

The ability to rapidly detect, control, and suppress fires that do occur is one of the primary defense-in-depth objectives of the fire protection program. The need for these physical protection features is governed by the plant's fire hazards and by the potential for a fire involving those hazards that might result in the release or spread of radioactive materials.

4.1 Fire Detection and Alarms Systems

Detection systems in operating reactor facilities are generally placed in locations where fire hazards present an exposure threat to safety-related equipment. Alarm systems are provided to alert plant staff in the event of a detected fire or operation of an automatic suppression system. During decommissioning, the fire hazards and the associated detection and alarm requirements may change significantly. The change in priorities, from protecting safety-related equipment required for safe shutdown to protecting against the release or spread of radioactive material, may require re-evaluation of the detection and alarm system designed to ensure that decommissioning fire hazards are adequately protected.

Fire alarm and supervisory signals should be annunciated in a constantly attended location. The fire alarm system should provide a signaling system for notifying plant personnel. Refer to NFPA 72, "National Fire Alarm Code." The fire alarm system should include the following specific functions.

- The operation of an automatic fire suppression system should initiate a fire alarm.

- Automatic fire detection systems using smoke, heat, or flame detectors, as appropriate, should be maintained for early detection of fires.

- Supervision of automatic fire suppression system control functions should be maintained, as appropriate, by the alarm system.

4.2 Fire Barriers

4.2.1 Designating Fire Areas

Fire areas are established to prevent or restrict the propagation of fires from one area of a facility to another, to protect personnel, and to limit the consequences of a fire. For operating reactors, fire area boundaries are generally based on the need to separate and protect safe shutdown systems. Based on a fire hazards analysis, fire areas may be redesignated to address the unique hazards and protection requirements of the decommissioning process. The designation of fire areas should be based on consideration of the hazards present; the potential for a fire in a given area to result in release of radioactive

materials; the ability to effectively contain, fight, and control the fire using manual suppression; and the ability of personnel to safely evacuate the plant.

4.2.2 Fire Barrier Requirements

Fire areas should be separated by fire-rated barriers. The fire resistance rating of a fire barrier should be commensurate with the potential for fire severity in each fire area. Construction components of fire barriers consist of walls, ceilings, and floors, along with structural supports including beams, joists, and columns. Openings in a fire barrier should be sealed by the installation of fire dampers, fire door assemblies, fire window assemblies, fire-rated penetration seals, and special floor drains. Fire barrier components and seals should be qualified by testing. The design and installation of fire barriers should be based on the applicable guidance in NFPA 80, "Standard for Fire Doors and Fire Windows"; NFPA 221; and NFPA 801.

4.3 Fire Suppression Systems

4.3.1 Fire Water Supply

During decommissioning, the plant fire water supply system should be maintained, and the system should be capable of providing the maximum water flow demand needed to supply automatic fire suppression systems and manual fire fighting. The system should be capable of delivering the maximum water flow demand for a minimum of two hours. The following factors should be considered in determining the adequacy of the water supply.

- Reliability of the water supply source.

- Availability of tanks or other water sources, pumps, fire hydrants, and distribution system.

- Adequate flow and pressure to meet water flow demands of automatic or manual fire suppression, or both, at the point of delivery.

- Capacity of the water supply source and distribution system. If the water system is a combined domestic, process, and fire system, the system should be capable of

supplying the maximum daily consumption or the peak hourly flow rate, whichever is higher, plus the maximum required fire flow.

Decommissioning activities may result in the isolation, removal, or abandonment of portions of the distribution system. Any system changes should be reviewed to ensure that adequate flow and coverage is provided to the remaining plant areas that contain radioactive materials, present a fire exposure threat to areas containing radioactive materials, or include systems necessary to mitigate the release of radioactive materials.

Where temperatures cannot reliably be maintained at or above 4 °C (40 °F), water based fire suppression system components should be protected against freezing in accordance with the applicable NFPA code. Freeze protection for sprinkler system components should be reviewed regularly during decommissioning activities.

Decommissioning activities should not be allowed to affect the water supply to the operating units or the fire water supplies and distribution systems that are shared at multi-unit sites, and the isolation capability between the units should be maintained.

The design and installation of the water supply systems should be based on the applicable guidance in NFPA 20, "Standard for the Installation of Centrifugal Fire Pumps"; NFPA 22, "Standard for Water Tanks for Private Fire Protection"; NFPA 24, "Standard for the Installation of Private Fire Service Mains and their Appurtenances"; and NFPA 801.

4.3.2 Automatic Fire Suppression Systems

Automatic fire suppression systems that exist at the time a plant enters the decommissioning phase should be maintained operable based on the fire hazards analysis; these systems should be able to protect plant egress routes for evacuation of plant personnel in the event of a fire.

Automatic fire suppression systems should be provided where flammable or combustible materials are used or stored. Construction of new or temporary structures to support decommissioning may require the installation of automatic systems based on the fire and radiological hazards of the structures. Some of the factors to consider in selecting the type of suppression system to be installed should be the types of fire hazards and health hazards, cleanup of the suppression agent, and the effect of the suppression agent on vital systems, structures, and components in the area. NFPA 11, "Standard for Low-Expansion Foam"; NFPA 11A, "Standard for Medium- and High-Expansion Foam Systems"; NFPA 12,

"Standard on Carbon Dioxide Extinguishing Systems"; NFPA 12A, "Halon 1301 Fire Extinguishing Systems"; NFPA 13, "Installation of Sprinkler Systems"; NFPA 15, "Standard for Water Spray Fixed Systems for Fire Protection"; NFPA 16, "Standard for the Installation of Deluge Foam-Water Sprinkler, and Foam-Water Spray Systems"; NFPA 16A, "Standard for the Installation of Closed-Head Foam-Water Sprinkler Systems"; NFPA 17, "Standard for Dry Chemical Extinguishing Systems"; NFPA 17A, "Standard for Wet Chemical Extinguishing Systems"; and NFPA 75, "Standard for the Protection of Electronic Computer/Data Processing Equipment," should be used as the bases for the design, installation, and operation of automatic fire protection systems.

The need for automatic fire protection systems in plant areas during decommissioning activities may change, depending on the type of operations being performed in an area, the addition or removal of combustible materials, or the removal of radioactive materials and contamination. Plant areas should be reviewed for changing conditions that could affect the need for automatic fire suppression systems.

4.3.3 Manual Fire Suppression Systems

Manual fire suppression systems should be provided in the plant to supplement automatic fire protection systems and to provide suppression coverage to areas not protected by automatic systems. Decommissioning activities may change the plant configuration and fire hazards, may require the construction of temporary enclosures or structures, and may necessitate the abandonment or removal of automatic systems as facilities are dismantled or modified and radiological hazards are removed. Adequate manual fire suppression capability must be provided or maintained based on the fire hazards analysis for decommissioning to ensure protection against fire-induced radioactive material releases.

Specific areas to consider in evaluating the manual fire protection systems provided include:

- Standpipe and hose systems should be maintained to provide manual fire suppression capabilities. Standpipe and hose systems should be maintained in areas of the plant that are above or below grade, that require long hose lays from the nearest hydrant, or that are required to maintain the confinement of airborne radioactive materials. Refer to NFPA 14, "Standard for the Installation of Standpipe and Hose Systems."

- Manually operated fire suppression systems may be provided to supplement automatic fire suppression systems or in areas where automatic fire suppression systems are not installed and are not needed to rapidly control a fire. The need for manually operated fire suppression systems should be based on consideration of the hazards present; the potential for a fire in a given area to result in release of radioactive materials; the ability to effectively contain, fight, and control the fire using manual suppression; and the ability of personnel to safely evacuate the area.

- Outside hydrants and hose houses should be maintained to support manual fire suppression of internal fires and to provide protection from the threat of external exposure fires to those plant areas that contain radioactive materials or SSCs necessary for the prevention or mitigation of radioactive material releases. Refer to NFPA 24 for additional information and guidance.

4.3.4 Onsite Fire Brigade and Offsite Fire Emergency Response

Manual fire fighting capability should be provided by an onsite fire brigade or by offsite emergency services, or by both. A fire emergency plan should be developed detailing the response to fire alarms and the responsibilities assigned to emergency response personnel (see Regulatory Positions 3.1--3.3 and 5.2). Refer to NFPA 600, NFPA 801, and NFPA 1500, for information and guidance on fire fighting activities, training, equipment and fire emergency plans. The following factors should be considered in determining the manual fire fighting capability.

- The magnitude and complexity of potential fires in and around plant areas where radioactive materials or contamination are present.

- The availability of onsite staffing for a fire brigade at any time.

- The availability of offsite emergency services. The capability (of staff and equipment) of the offsite emergency services should be evaluated along with response time, training, and access to the plant site.

- The compatibility of the plant's fire system connections and fittings with those provided on the fire apparatus and equipment of offsite responders.

Fire fighting equipment should be provided for manual fire fighting, including hoses, nozzles, protective clothing, breathing apparatus, communications equipment, salvage equipment, ladders, smoke removal equipment, portable lighting, portable radiation monitoring equipment, extinguishers, and miscellaneous tools. (See Regulatory Position 3.6.1.)

Periodic drills and exercises should be performed by the onsite fire brigade and offsite emergency services. See Regulatory Position 3.3.3 for training for the fire brigade and offsite personnel.

5. RISK MANAGEMENT

5.1 Personnel Safety

The fire protection program should include elements that provide for personnel safety in the event of a fire. Egress and evacuation routes should be clearly established and maintained under the changing plant configuration. The effect of smoke on exiting personnel should be considered. Emergency lighting and alarm notification should be provided, and personnel should be appropriately trained in proper fire response. Policies and procedures should establish radiological control and security practices to be implemented under emergency (fire) evacuation scenarios. NFPA 101, "Code for Safety to Life from Fire in Buildings and Structures," provides additional information and guidance for ensuring personnel safety.

5.2 Emergency Response

For operating reactors, early detection and application of manual suppression can be critical in minimizing the fire damage to safe shutdown systems that are necessary to prevent damage to the reactor core and subsequent releases of radioactive material. In comparison, the threat of fuel damage is reduced during decommissioning as the fuel is stored in the spent fuel pool or other approved storage facility. Under these conditions of spent fuel storage, fire suppression response times may not be as critical. The necessary fire emergency response

capability should be determined based on the fire hazards and the potential for those hazards to involve radioactive material.

The fire protection program should identify the responsibilities of the licensee's organization and of offsite responders in the event of a fire emergency. While an adequately prepared, trained, and equipped plant fire brigade may suppress small fires and provide the initial assault and control on larger fires, a fully equipped fire service should provide the primary force in the manual suppression of large structure or site-area fires. This fire service may be provided by offsite agencies provided any offsite responders have the necessary qualifications and capabilities as described in Regulatory Positions 3.1, 3.2, 3.3, and 4.3.4. If the licensee maintains an onsite fire brigade, the assignment of personnel to the brigade should not adversely affect the ability of the remaining plant staff to respond to the event and maintain plant functions, such as security, radiation control, and operations.

The event management and command structure should be clearly established, including the fire attack roles and responsibilities of the onsite brigade and offsite responders. Security control and radiation dosimetry requirements for offsite emergency responders should be clearly established and should not delay the response.

D. IMPLEMENTATION

The purpose of this section is to provide information to licensees and applicants regarding the NRC staff's plans for using this regulatory guide.

This draft guide has been released to encourage public participation in its development. Except in those cases in which the applicant or licensee proposes an acceptable alternative method for complying with specified portions of the NRC's regulations, the methods to be described in the final guide reflecting public comments will be used in the evaluation of submittals for licensing basis documents and periodic revisions or updates to the decommissioning fire protection program that is submitted in accordance with the required updates to the Final Safety Analysis Report (FSAR).

REFERENCES

The following is a list of the National Fire Protection Association (NFPA) standards referenced in this regulatory guide. There may be additional NFPA and industry standards that are part of the existing fire protection program for a given plant. Continued compliance with existing program standards should be reviewed with due consideration of existing license commitments and conditions, and the fire protection design basis of the specific plant. NFPA standards may be purchased from the National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9146, Quincy, MA 02269-9959 (telephone 1-800-344-3555).

NFPA 1, "Fire Prevention Code."

NFPA 11, "Standard for Low-Expansion Foam."

NFPA 11A, "Standard for Medium- and High-Expansion Foam Systems."

NFPA 12, "Standard on Carbon Dioxide Extinguishing Systems."

NFPA 12A, "Halon 1301 Fire Extinguishing Systems."

NFPA 13, "Installation of Sprinkler Systems."

NFPA 14, "Standard for the Installation of Standpipe and Hose Systems."

NFPA 15, "Standard for Water Spray Fixed Systems for Fire Protection."

NFPA 16, "Standard for the Installation of Deluge Foam-Water Sprinkler, and Foam-Water Spray Systems."

NFPA 16A, "Standard for the Installation of Closed-Head Foam-Water Sprinkler Systems."

NFPA 17, "Standard for Dry Chemical Extinguishing Systems."

NFPA 17A, "Standard for Wet Chemical Extinguishing Systems."

NFPA 20, "Standard for the Installation of Centrifugal Fire Pumps."

NFPA 22, "Standard for Water Tanks for Private Fire Protection."

NFPA 24, "Standard for the Installation of Private Fire Service Mains and their Appurtenances."

NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems."

NFPA 30, "Flammable and Combustible Liquids Code."

NFPA 51B, "Standard for Fire Prevention in Use of Cutting and Welding Processes."

NFPA 55, "Use and Handling of Compressed and Liquefied Gases in Portable Cylinders "

NFPA 72, "National Fire Alarm Code."

NFPA 75, "Standard for the Protection of Electronic Computer/Data Processing Equipment."

NFPA 80, "Standard for Fire Doors and Fire Windows."

NFPA 80A, "Recommended Practice for Protection of Buildings from Exterior Fire Exposures."

NFPA 101, "Code for Safety to Life from Fire in Buildings and Structures."

NFPA 221, "Standard for Fire Walls and Fire Barrier Walls."

NFPA 241, "Standard for Safeguarding Construction, Alteration, and Demolition Operations."

NFPA 600, "Standard on Industrial Fire Brigades."

NFPA 701, "Standard Methods of Fire Tests for Flame-Resistant Textiles and Films."

NFPA 801, "Standard for Facilities Handling Radioactive Materials."

NFPA 1500, "Fire Department Occupational Safety and Health Program."

APPENDIX A
GLOSSARY

The following definitions apply to the terms as used in this guide. These definitions have been taken from existing regulatory documents and industry fire protection standards where possible. Where published definitions were not available, definitions have been developed as necessary for use with this guidance.

Abandonment. Permanently ceasing the use, operation, and maintenance of a structure, system, or component through deactivation and isolation without intent to return the structure, system, or component to service.

Approved. Tested and accepted for a specific purpose or application by a nationally recognized testing laboratory.

Co-located facilities. Facilities that share a common site with the nuclear power plant, including any temporary structures.

Combustible material. Any material that will burn or sustain the combustion process when ignited or otherwise exposed to fire conditions.

Contamination. Fixed or loose residual radioactive material deposited inside or external to structures, systems, and components where it is not desired; it presents a potential radiological hazard.

Deactivation. Shutting down or otherwise idling plant systems and components to prevent their operation, particularly in preparation for abandonment or removal.

Decommissioning. Safely removing a facility or site from service and reducing residual radioactivity to a level that permits release of the property for unrestricted use and termination of the license or release of the property under restricted conditions and termination of the license..

Dismantlement. Physically disassembling and removing plant structures, systems, and components.

Emergency responders. Organizations and individuals who respond to plant emergency events, including licensee emergency management and response staff, security personnel, and fire brigades, as well as offsite responders including law enforcement officials, medical personnel, and fire departments.

Fire apparatus. Vehicles specifically designed to respond to fire events that provide fire fighting tools, equipment, and fire suppression capability.

Fire area. A portion of a structure that is separated from other areas by fire barriers.

Fire barrier. Components of construction (e.g., walls, floors, ceilings, and their supports such as beams, joists, and columns; penetration seals; fire doors; and fire dampers) that are used to

prevent the spread of fire and that are rated by approving laboratories in hours of fire resistance.

Fire brigade. A team of onsite plant personnel who have been specifically assigned the responsibility for fire fighting and who are adequately equipped for and trained in fighting fires.

Fire exposure hazard. A fire hazard that is external to a structure, system, or component located in or adjacent to the same area. The effects of an exposure to fire (e.g., smoke, heat, ignition) may adversely affect the capabilities of adjacent structures, systems, and components to perform their safety function to prevent or mitigate the release of radioactive material.

Fire hazard. Conditions that involve the elements necessary to initiate and support combustion, including in situ or transient combustible materials, ignition sources (e.g., heat, sparks, open flames), and an oxygen environment.

Fire retardant material. Material that has been coated or treated with chemicals, paints, or other materials that are designed to reduce the combustibility of the treated material.

Fire risk. The combination of the probability of a given fire event occurring and of the estimated consequences of the event should it occur.

Fire watch. One or more persons responsible for providing additional (e.g., during hot work) or compensatory (e.g., for system impairments) coverage of plant activities or areas for the purpose of detecting fires or identifying activities and conditions that present a potential fire hazard. The individual should be trained in identifying conditions or activities that present potential fire hazards, as well as in the use of fire extinguishers and the proper fire notification procedures.

Hot work. Activities that involve the use of heat, sparks, or open flame (such as cutting, welding, and grinding) and that are typically controlled by a formalized work permit system controlled or reviewed by a fire protection engineer.

Impairment. Degradation of a fire protection system that affects the ability of the system to perform its intended functions.

Independent spent fuel storage installation (ISFSI). A complex designed and constructed for the interim storage of spent nuclear fuel and other radioactive materials associated with spent fuel storage.

Lay-down areas. Areas used for the temporary staging of materials prior to their use or disposal.

Listed. Equipment or materials on a list published by a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation that periodically inspects production of the listed equipment or materials. This listing states that the equipment or materials meet nationally recognized standards and have been tested and found suitable for use in a specified manner.

Monitored storage. The operations and conditions associated with a permanently shutdown plant that has no fuel in the reactor and for which decommissioning has been deferred to the future.

Noncombustible material. A material which, in the form it is used and under conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. Also a material with a structural base of noncombustible material, as defined above, with a surfacing not over 1/8 inch thick that has a flame-spread rating not higher than 50 when measured using ASTM E-84 (1997), "Standard Test Method for Surface Burning Characteristics of Building Materials."[1]

Performance-based approach. A method of implementation based on measurable performance goals and objectives.

Permanently ceased operations. Certification by a licensee to the NRC that it has permanently ceased or will permanently cease reactor operations, or a final legally effective order to permanently cease operations has come into effect.

Permanent fuel removal. Certification by the licensee to the NRC that it has permanently removed all fuel assemblies from the reactor vessel.

Pre-plans. Documentation that describes the facility layout, access, contents, construction, hazards, hazardous materials, types, and locations of fire protection systems and other information important to the formulation and planning of emergency fire response.

Radiological hazard. The presence of radioactive material, including sources, contamination, wastes, and spent fuel, that present a radiological exposure hazard to plant personnel or that may be released in the event of a fire.

Safe shutdown. For fire events, those plant conditions specified in the plant technical specifications as hot standby, hot shutdown, or cold shutdown.

Spent fuel. Reactor fuel assemblies that have been irradiated in the reactor core.

Standards-of-record. The standards, including specific editions, that constitute the licensing or design basis for the plant.

Structures, systems, and components (SSCs). Structural elements, plant systems, and components that function to prevent or mitigate the release of radioactive materials in the event of a fire; may include such items as physical confinement barriers (building walls, floors, ceilings), ventilation systems, spent fuel cooling systems and support systems, and waste storage containers.

Temporary structures. Buildings, tents, shelters, platforms, or other structures that are erected for the purpose of supporting decommissioning activities. They are not permanent site facilities.

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[1]ASTM E-84 is available from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

Turnout gear. Protective clothing for fire fighting such as coats, pants, boots, helmets, gloves, and self-contained breathing apparatus (SCBA).

Transient combustibles. Combustible materials that are not fixed in place or an integral part of an operating system or component.

Unrestricted use. Areas in which the licensee neither limits nor controls access by the general public and in which the public exposure requirements of 10 CFR Part 20 apply.

APPENDIX B

EXAMPLES OF FIRE PROTECTION FOR SELECTED FIRE AREAS, STRUCTURES, SYSTEMS, AND COMPONENTS

The following examples provide a general description of acceptable fire protection for selected plant areas that may contain radiological hazards. These examples are generic and do not encompass all possible radiological and fire hazards for a plant undergoing decommissioning. These examples are provided for guidance and information and do not constitute NRC requirements.

Spent Fuel Pool Area

The fire hazards in the spent fuel pool area, and those in adjacent areas that present an exposure hazard or could propagate to the spent fuel pool area, should be quantified. The potential for these fire hazards to impact radioactive materials including the spent fuel should be evaluated.

The radiological hazards in the area should be quantified, including the spent fuel and any radioactive waste or contamination that may contribute to a radiological release if exposed to fire. Potential releases of radioactive materials should be quantified based on conservative analysis of the fire-related source term, the effects of mitigating systems, and emergency response actions. Exposures resulting from the fire-induced release of radioactive materials should not exceed the limits of 10 CFR Part 20.

Structures, systems, and components (SSCs) that are necessary to provide protection of the spent fuel and mitigate any radiological release should be evaluated and protected from the effects of fire, as appropriate. These systems may include building ventilation, spent fuel pool cooling and makeup, instrumentation and controls, and electrical power. Rated fire barriers should be maintained that provide separation between significant fire hazards and SSCs important to the safe operation of the spent fuel pool. Where adequate separation cannot be provided, the use or storage of combustible materials should be minimized and controlled.

If a fire in the spent fuel pool area could result in a loss of the normal spent fuel pool cooling and makeup systems or a rapid loss of pool inventory, the ability to maintain spent fuel integrity and minimize the potential for radiological release should be established,

including identification and evaluation of alternative cooling and makeup capabilities. The response time for re-establishing cooling and makeup capability for the spent fuel pool should be quantified based on the need to ensure that fuel integrity is maintained and radiological exposure limits for emergency response personnel including fire-fighters are not exceeded.

Procedures should be developed that describe equipment configurations and necessary operator actions in response to a fire in the spent fuel pool area. For example, ventilation systems and any other building openings such as access doors should be configured to provide confinement and minimize the potential for a release of radioactive materials to the environment. Spent fuel cooling and makeup system components may have to be de-energized or may require local operation (i.e., outside of the fire area) if electrical and control systems are subject to potential fire damage.

Administrative controls for housekeeping, transient combustibles, and hotwork in the spent fuel area should be established by procedures. The work control procedures should ensure that decommissioning activities associated with spent fuel pool operations and maintenance, including any fuel movement or handling operations such as cask loading and shipment, are subject to appropriate fire protection reviews.

Smoke detection and fire suppression capability for the spent fuel pool area should be provided. Fire alarms and emergency lighting for personnel evacuation should be provided. As a minimum, manual suppression capability should be available from portable fire extinguishers and standpipes or hose stations, or both. Manual fire suppression systems should provide adequate coverage based on the fire hazards, evacuation routes, and fire attack strategies. Water supplies should be sufficient to meet suppression system demands.

Fire pre-plans should be developed for the spent fuel pool area that identify the area layout, access and egress points, type and location of suppression systems, significant fire hazards, radioactive and toxic material hazards, and SSCs important to the prevention or mitigation of radioactive material releases that should be protected from the effects of fires. Onsite fire brigades and offsite responders should be adequately trained and drilled on the pre-plans and general fire attack strategy for the spent fuel pool area.

Radioactive Waste Storage and Accumulation Areas, Including Temporary Structures

Specific plant areas or separate structures should be provided for the storage of radioactive wastes. Waste accumulation areas within the plant may be necessary to support

certain decommissioning activities. Combustible waste should be moved from accumulation areas to designated storage areas daily. The waste storage and accumulation areas should provide adequate separation and protection of the waste from exposure fire hazards. Temporary structures provided for interim waste storage should comply with the appropriate fire codes and should be designed to prevent or minimize the potential for radioactive material releases in the event of a fire.

The fire hazards in the radioactive waste storage and accumulation areas, and those in adjacent areas that present an exposure hazard or could propagate to the waste storage and accumulation areas, should be quantified. The potential for these fire hazards to impact radioactive materials should be evaluated. Specific consideration should be given to evaluating special hazards such as contaminated electrical cables and plastics that, if ignited, can be difficult to suppress and can emit considerable quantities of acrid smoke and toxic gases that may hamper fire fighting and evacuation efforts. Confinement measures should be provided as necessary to mitigate release of radioactive materials entrained in the smoke and gases.

Conservative estimates of the radioactive material content for stored wastes should be established, to the extent possible, based on standard survey and measurement requirements. These estimates, combined with any contamination in the area, should be used as the basis for estimating potential radioactive material releases in the event of a fire. Potential releases of radioactive materials should be quantified, based on conservative analyses of the fire-related source term, the effects of mitigating systems, and emergency response actions. Exposures resulting from the fire-induced release of radioactive materials must not exceed the limits in 10 CFR Part 20.

Radioactive waste storage areas within existing plant structures should provide adequate fire protection that minimizes the potential for fire and the subsequent release of radioactive materials. SSCs that are necessary to provide protection of radioactive waste and mitigate any radiological release should be evaluated and protected from the effects of fire, as appropriate. These SSCs may include structures that provide separation and confinement, building ventilation, instrumentation and controls, and electrical power. Rated fire barriers should be maintained that provide separation between significant fire hazards, the waste storage and accumulation areas, and SSCs important to safe storage of the contaminated waste materials. Where adequate separation cannot be provided, the use and storage of combustible materials should be minimized and controlled.

Temporary structures used for radioactive waste storage areas should be constructed with noncombustible materials to the extent possible. Radioactive waste packaging should be fabricated of noncombustible or fire-retardant materials. Activities and equipment that present a potential ignition source should be prohibited or strictly controlled within waste storage areas.

Smoke detection and fire suppression capability should be provided for the areas where radioactive waste materials will be accumulated or stored. Fire alarms and emergency lighting for personnel evacuation should be provided. As a minimum, manual suppression capability, including portable fire extinguishers, should be available. Confinement measures should be provided to control potentially contaminated run-off from automatic or manual fire suppression, including inadvertent actuation of automatic systems. For temporary structures, automatic or manual fire suppression, or both, should be provided based on the fire hazards and the need to maintain adequate confinement to prevent or minimize the potential release of radioactive materials. Automatic and manual fire suppression systems should provide adequate coverage based on the fire hazards, evacuation routes, and fire attack strategies. Water supplies should be sufficient to meet automatic (if applicable) and manual suppression system demands.

Administrative controls for housekeeping, transient combustibles, and hotwork in the radioactive waste storage and accumulation area should be established by procedures. Noncombustible or fire resistant materials should be used for packaging radioactive waste materials. The work control procedures should ensure that decommissioning activities associated with the removal and storage of radioactive waste, including packaging and shipment of radioactive materials, are subject to appropriate fire protection reviews.

Procedures should be developed that describe necessary actions in response to a fire in the radioactive waste storage and accumulation areas. For example, ventilation systems and any other building openings such as access doors should be configured to provide confinement and minimize the potential for a release of radioactive materials to the environment. Consideration should be given to waste storage area layout and the availability of standpipes (i.e., to avoid hose lays through doors) to allow fire fighting activities while maintaining adequate confinement.

Fire pre-plans should be developed for the radioactive waste storage and accumulation areas that identify the area layout, access and egress points, type and location of suppression systems, radiological hazards, and SSCs important to the prevention or mitigation of

radioactive material releases that should be protected from the effects of fires. Onsite fire brigades and offsite responders should be adequately trained and drilled on the pre-plans and general fire attack strategy for the radioactive waste storage and accumulation areas.

REGULATORY ANALYSIS

A separate regulatory analysis was not prepared for this regulatory guide. The regulatory analysis prepared for the amendments to Parts 2, 50, and 51, "Decommissioning of Nuclear Power Reactors," which was issued on July 29, 1996 (61 FR 39278), provides the regulatory basis for this guide and examines the costs and benefits of the rule as implemented by the guide. A copy of this regulatory analysis is available for inspection or copying for a fee in the NRC Public Document Room, 2120 L Street NW., Washington, DC; the PDR's mailing address is Mail Stop LL-6, Washington, DC 20555; telephone (202)634-3273; fax (202)634-3343.

PRESENTATION MATERIAL USED BY THE STAFF

Attachment 3

TRANSPORTATION OF RADIOACTIVE MATERIALS

- Transportation is authorized by General License (10 CFR 71.12)

- Shipping containers must be approved by NRC

- NRC issues Certificates of Compliance to approve package designs

- Currently have about 170 Certificates of Compliance

Attachment 3A

PACKAGE SAFETY STANDARDS

- Consistent with international regulations

- Performance standards for Normal and Accident Conditions

- Safety demonstration may be by:

  full-scale test

  scale-model test

  engineering analysis and evaluation

ACCIDENT CONDITION TESTS

Sequential tests, damage is compounded:

- 30-foot drop (most damaging orientation)
- 40-inch puncture onto steel pin (most damaging orientation)
- 30 minute fire test
- Immersion under water (fissile packages only)

Post-test acceptance standards

- Containment
- Sub-criticality
- External Dose Rate

AMERSHAM MODEL NO. 660

Industrial Radiography Camera

- Weighs about 50 pounds
- Up to 140 Ci of Iridium-192
- Design approved in 1974
- Over 3000 units in service worldwide

AMERSHAM MODEL NO. 660

CAL required retests because: 6/97

- information in SAR was not accurate
- puncture test not properly performed

Test unit failed when re-tested. 10/97

NRC Certificate amended to require shipment in a steel drum or box. 11/97

Amersham has tested units with design modifications that can be incorporated into existing packages. 12/97

Testing of modifications still in progress.

TESTING OF AMERSHAM MODEL NO. 660

Results of testing unmodified packages

First design modification	- replace carbon steel bolts with stainless steel bolts.
Second design modification	- added shield collar.

CONSIDERATIONS

If shield collar performs as expected then the staff will:

a. Allow shield collar to be used on existing packages, as a substitute for shipping within a steel drum or box.

b. Not allow shield collar for new units. A more positive design change should be used for future fabrication.

CRGR CONSIDERATIONS

- Testing interpretation - Multiple licensees involved

- Backfit to NRC approved design to redo tests and make modifications

- Bulletin 97-02 issued on Puncture Testing of Shipping Packages

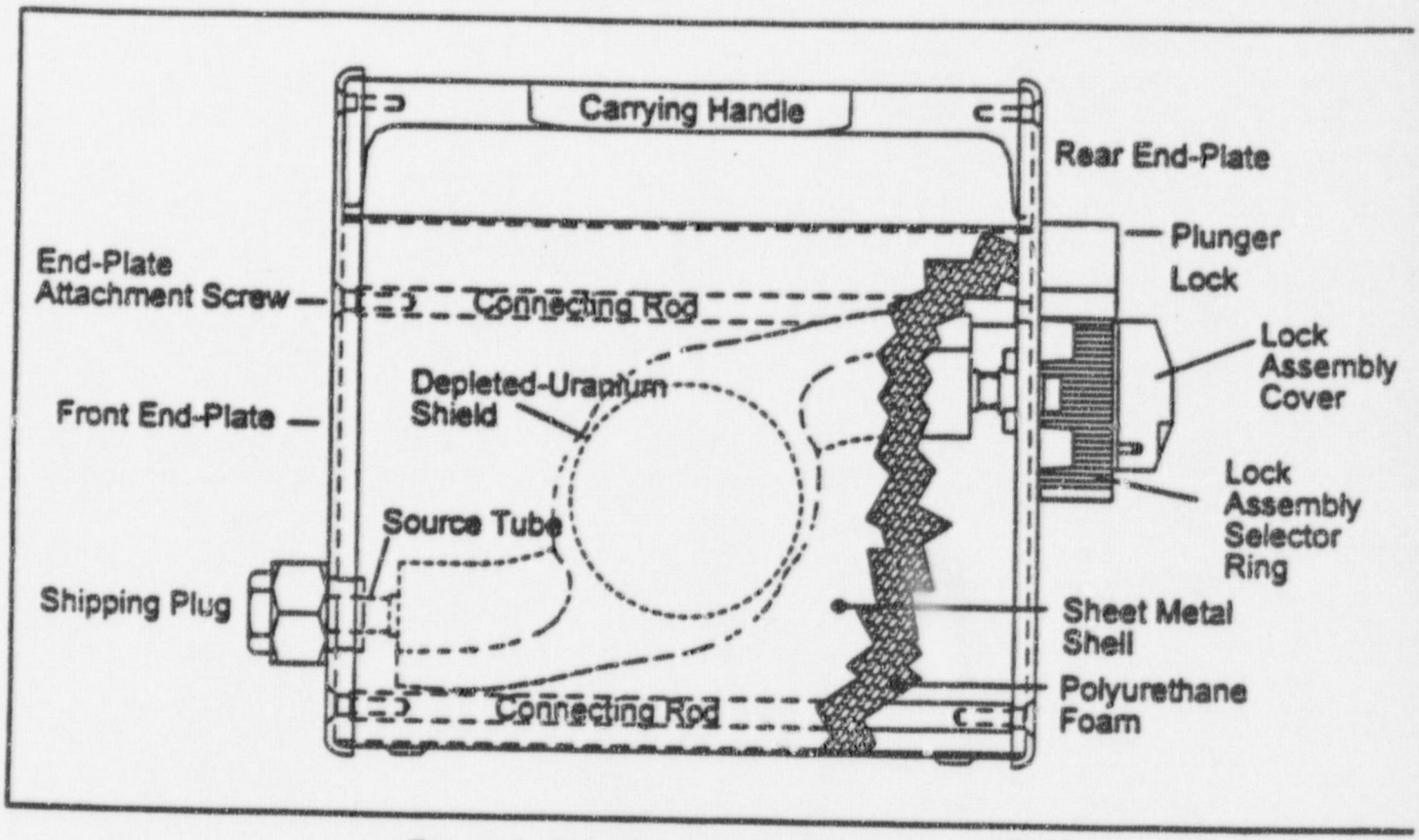

Figure 1: Side View of a Model 660 Series Projector

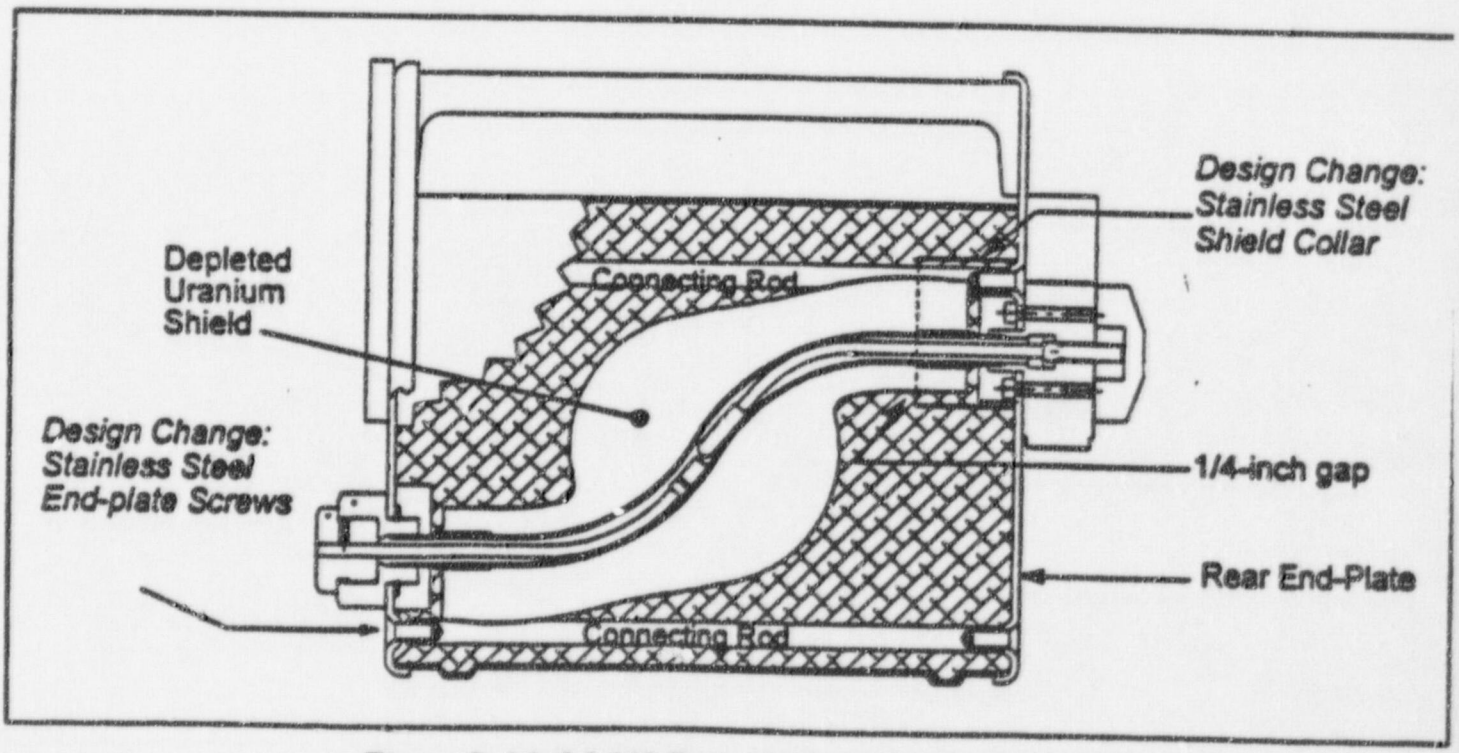

Figure 2: Model 660 Series Projector with Design Changes

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 1, 1999

MEMORANDUM TO: William D. Travers
Executive Director for Operations

FROM: Joseph A. Murphy, Chairman
Committee To Review Generic Requirements

SUBJECT: MINUTES OF THE CRGR MEETING NUMBER 317

The Committee To Review Generic Requirements (CRGR) met on Tuesday, March 17, 1998, from 9:00 am to 12:00 noon. Attachment 1 contains the list of attendees.

D. Matthews (NRR) presented for CRGR review and endorsement the draft Regulatory Guide (DG-1069) titled "Fire Protection Program for Nuclear Power Plants During Permanent Shutdown and Decommissioning." Attachment 2-A contains the presentation material used by the staff. The Committee made various comments and recommendations, and asked that staff provide resolution of one particular comment -- regarding applicability of 10 CFR Part 100 guidelines -- to the CRGR staff for further consultation with the Committee. The Committee, however, did not wish to review the revised guide. Based on satisfactory resolution of CRGR comments and recommendations, on April 6, 1998, the Committee endorsed the revised guide for issuance for public comments (Attachment 2-B).

C. Haughney (NMSS) briefed the CRGR seeking Committee's advice on proposed modifications to address design deficiencies in the Amersham Model 660 Radiography Camera. The staff's presentation material is included as Attachment 3. The specific concerns were those related to the possible failure of Amersham Model No. 660 radiography camera to satisfy the 30-foot drop, 40-inch puncture onto steel pin[1], and 30-minutes fire tests. At the time of CRGR briefing, Amersham had been conducting these tests and considering possible design modifications for incorporating them in the future production. In particular, two specific design modifications were under consideration. One of them was replacement of the carbon steel bolts with stainless steel bolts, and the other one was inclusion of an added shield collar. The Committee offered various comments. However, since this meeting, the Committee has been informed that the prototypes Model 660 camera with the latter modification had failed the drop test and, as a result, Amersham has decided to use over-pack instead.

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[1] During a briefing at the 309th CRGR meeting, held on August 5, 1997, the NMSS staff had indicated that a bulletin on the subject of puncture testing was being considered. Subsequently, at CRGR Meeting No. 333, which was held on November 27, 1998, the staff briefed the Committee on the closure of Bulletin 97-02, "Puncture Testing of Shipping Packages Under 10 CFR Part 71."

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In accordance with the EDO's July 18, 1983 directive concerning "Feedback and Closure of CRGR Review", a written response is required from the cognizant office to report agreement or disagreement with the CRGR recommendations in these minutes. The response is to be forwarded to the CRGR Chairman and if there is disagreement with the CRGR recommendations, to the EDO for decision making.

Questions concerning these meeting minutes should be referred to Raji Tripathi (415-7584).

Attachments: As stated

cc: Commission (5)
M. Knapp, DEDE
J. Lieberman, OE
H. Bell, OIG
J. Larkins, ACRS
L. Reyes, R-II
E. Merschoff, R-IV
A. Thadani, RES
J. Lieberman, OE
C. Haughney, NMSS
SECY
F. Miraglia, DEDO
M. Springer, ADM
K. Cyr, OGC
H. Miller, R-I
J. Dyer, R-III
C. Paperiello, NMSS
S. Collins, NRR
D. Matthews, NRR

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