

# **MODULE 1.0: NRC GUIDANCE ON FIRE PROTECTION FOR FUEL CYCLE FACILITIES**

## **Introduction**

Welcome to Module 1.0 of the Fire Protection for Fuel Cycle Facilities Directed Self-Study Course! This is the first of four modules in this self-study course. The purpose of this module is to assist the trainee in relating NRC guidance documents to recognized good industry practices in the area of fire protection. This self-study module is designed to assist you in accomplishing the learning objectives listed at the beginning of the module. There are two learning objectives in this module. The module has self-check questions and activities to help you assess your understanding of the concepts presented in the module.

## **Before You Begin**

It is recommended that you have access to the following materials:

- ❑ Trainee Guide
- ❑ NRC Branch Technical Position 57 Federal Register (FR) 35607, "Guidance on Fire Protection for Fuel Cycle Facilities"
- ❑ NUREG-1513, "Integrated Safety Analysis Guidance Document"
- ❑ NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," Section 7.0, "Fire Safety"
- ❑ NRC Inspection Procedures 88054 and 88055, "Fire Protection"

Complete the following prerequisites:

- ❑ There are no prerequisites to this module.

## **How to Complete this Module**

1. Review the learning objectives.
2. Read each section within the module in sequential order.
3. Complete the self-check questions and activities within this module.
4. Check off the tracking form as you complete each activity within the module.
5. Contact your administrator as prompted for a progress review meeting.
6. Contact your administrator as prompted for any additional materials and/or specific assignments.
7. Complete all assignments related to this module. If no other materials or assignments are given to you by your administrator, you have completed this module.
8. Ensure that you and your administrator have dated and initialed your progress on your tracking form.
9. Go to the next assigned module.

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### LEARNING OBJECTIVES

- 1.1 Upon completion of this module, you will be able to relate NRC guidance documents to recognized good industry practices in the area of fire protection. You will be able to:
  - 1.1.1 Identify the purpose of selected NRC guidance documents:
    - NRC Branch Technical Position 57 Federal Register (FR) 35607, "Guidance on Fire Protection for Fuel Cycle Facilities"
    - NUREG-1513, "Integrated Safety Analysis Guidance Document"
    - NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," Section 7.0, "Fire Safety"
    - NRC Inspection Procedures 88054 and 88055, "Fire Protection"
  - 1.1.2 Identify the inspection objectives stated in NRC Inspection Procedures 88054 and 88055.

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### INTRODUCTION

The regulatory requirement for fire safety at fuel cycle facilities is implied in the more general requirement of the U.S. Code of Federal Regulations (CFR), 10 CFR 70, "Domestic Licensing of Special Nuclear Material." The CFR states, "the applicant's proposed equipment and facilities (be) adequate to protect the health and minimize danger to life or property." In addition to NRC requirements, the facilities have to comply with local building codes and with conditions imposed by fire insurers. To date, the fire insurance and the building code requirements have often been the mainstay of fire protection for these facilities.

The requirements in 10 CFR 70.64 apply to new facilities or new processes at existing facilities. Part 70.64(a) gives baseline design criteria applicable to new or existing facilities that require a license amendment under Part 70.72. The criteria do not require retrofits to existing facilities or existing processes. Part 70.64(a)(3) gives the baseline design criteria for fire protection: "The design must provide for adequate protection against fires and explosions."

The revised regulation, 10 CFR 70.62, requires that each licensee establish and maintain a safety program that demonstrates compliance with the performance requirements in § 70.61.

To be approved by the NRC, any application for a license to possess and use licensed materials at a fuel cycle facility must provide information showing that the applicant's proposed equipment, facilities, and procedures are adequate to protect health and minimize danger to life or property.

The regulatory basis for the review should be the general and additional contents of an application as required by 10 CFR 70.22 and 70.65. In addition, the fire safety review should be conducted to provide reasonable assurance of compliance with 10 CFR 70.61, 70.62, and 10 CFR 70.64 for new facilities or new processes.

Also, 10 CFR Part 50.48(a)(1) states that each operating nuclear power plant must have a fire protection plan. See also National Fire Protection Association (NFPA) 805 in Fire Fundamentals, which describes "Performance-Based Protection for Light Water Reactors."

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### Learning Objective

When you finish this section, you will be able to:

1.1.1 Identify the purpose of selected NRC guidance documents:

- NRC Branch Technical Position 57 Federal Register (FR) 35607, "Guidance on Fire Protection for Fuel Cycle Facilities"
- NUREG-1513, "Integrated Safety Analysis Guidance Document"
- NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," Section 7.0, "Fire Safety"
- NRC Inspection Procedures 88054 and 88055, "Fire Protection"

### NRC GUIDANCE DOCUMENTS

The NRC provides guidance to applicants and licensees on what the NRC considers acceptable industrial practice. Other approaches to the selection of equipment, design of facilities, and operational procedures are acceptable, provided that they grant equal or higher levels of protection of health and safety.

This module reviews four NRC guidance documents on fire protection issues at fuel cycle facilities. These are:

- NRC Branch Technical Position 57 FR 35607, "Guidance on Fire Protection for Fuel Cycle Facilities" (included for historical reference)
- NUREG-1513, "Integrated Safety Analysis Guidance Document"
- NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," Section 7.0, "Fire Safety"
- NRC Inspection Procedure Procedures 88054 and 88055, "Fire Protection" (Annual) (See Appendix B for complete document.)

An additional guidance document is NUREG-1718, "Standard Review Plan for the Review of an Application for a Mixed Oxide (MOX) Fuel Fabrication Facility, Section 7.0., "Fire Protection."

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The guidance adheres to 10 CFR Part 70. Part 70 influences fire protection in 70.61 (Performance Requirements) and 70.64 Baseline Design Criteria (BDC). 70.61 sets forth performance requirements that must consider radiological consequences from fires. Under BDC, the applicant must establish a design that provides for “adequate protection against fires and explosions” [70.64(a) (3)] and that incorporates Defense-In-Depth (DID) practices [70.64(b)]. The DID principle is aimed at preventing fires from starting, detecting and quickly extinguishing any fires that do start, and designing a plant that will minimize the effect of a fire on essential functions.

To read the standards for review of fire protection at a MOX facility, a copy of NUREG-1718, Section 7.0, “Fire Protection,” is in the Supplemental Reading following this module.

NRC guidance documents are available on the NRC Web site.

### **NRC BRANCH TECHNICAL POSITION 57 FR 35607, "FIRE PROTECTION FOR FUEL CYCLE FACILITIES"**

On August 10, 1992, the NRC reissued a revised Branch Technical Position (BTP) on Fire Protection for Fuel Cycle Facilities (57 FR 35607). The BTP was issued to address the finding that fire protection is one of the most important safety concerns following an assessment of operational safety at fuel cycle facilities.

#### **Purpose**

The purpose of 57 FR 35607 is to serve as a source of information for applicants and licensees on the features of equipment, facilities, and procedures that can be used to provide reasonable assurance of fire safety for fuel cycle facilities. It provides guidance for implementing fire protection programs at these facilities that would be acceptable to the NRC staff as having the elements necessary to protect health and minimize danger to life or property.

#### **Fire Protection Concept**

The concept of fire protection presented by the BTP consists of measures that will achieve a balance among the following:

- ☐ Fire prevention
- ☐ Fire detection and alarm
- ☐ Fire containment and suppression

#### **NRC Position**

The NRC position specifies the elements needed to support the fire protection concept. These are:

- ☐ Fire protection program

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- ❑ Administrative controls
- ❑ Building construction
- ❑ Combustible and Ignition control
- ❑ Ventilation system
- ❑ Process fire safety
- ❑ Fire detection and alarm system
- ❑ Fire suppression equipment
- ❑ Fire protection water system
- ❑ Fire hazard analysis
- ❑ Pre-fire plan
- ❑ Offsite Emergency Response
- ❑ Fire emergency response team

Apart from providing guidance on good industry practices and standards for buildings, equipment, maintenance, and training, the Branch/Technical Position (BTP) introduced the concept of a Fire Hazard Analysis (FHA) to identify deficiencies in the fire protection program of a facility. It described the FHA as a systematic study of each "fire area" of the facility, and of the facility as a whole, in order to identify and quantify all credible fire hazards that could affect the containment and safety of licensed radioactive materials, so that adequate controls can be provided to reduce those risks to acceptable levels. The BTP also stressed the importance of the Pre-fire Plan to the preparedness of the facility to meet all credible fire emergencies.

A Pre-fire Plan contains information to assist a fire fighting team in an actual emergency situation. It is recommended that the plan be prepared in consultation with the local fire department, where such off-site assistance is relied upon. The importance to safety of a Pre-fire Plan cannot be over-emphasized. The firefighters' ability to promptly locate ordinary installed hardware, such as a compatible connection for delivery of water or a sectional valve, may be critical in an emergency situation. The purpose of the Pre-fire Plan is to provide exactly such information. The Pre-fire Plan should also be a training tool for both the facility's emergency response team and the offsite fire department that is expected to assist the facility in an emergency.

### **NUREG-1513, "INTEGRATED SAFETY ANALYSIS GUIDANCE DOCUMENT"**

The NRC issued a revised rule in 2000 for 10 CFR Part 70 for licensing the use of special nuclear material. In the revised rule, the NRC included a requirement that certain licensee/applicants subject to 10 CFR 70 conduct an integrated safety analysis (ISA).

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ISA is a systematic examination of a facility's processes, equipment, structures, and personnel activities to ensure that all relevant hazards that could result in unacceptable consequences have been adequately evaluated and appropriate protective measures have been identified.

Recognizing that NRC fuel cycle facilities are, to a large extent, chemical processing plants, the ISA techniques that have been applied to plants in the chemical and petrochemical industries are generally applicable to NRC facilities.

In addition, ISA techniques applied to nuclear fuel cycle facilities must address the special hazards that are present at such facilities and their potential for causing criticality incidents and radiological releases, as well as certain chemical releases.

### Purpose

The purpose of the Integrated Safety Analysis Guidance Document is to provide guidance to NRC fuel cycle licensee/applicants on how to perform an ISA and document the results. In particular, the document defines an ISA, identifies its role in a facility's safety program, identifies and describes several generally accepted ISA methods, and provides guidance in choosing a method.

Although there are many critical elements that make up a robust safety program, such as training, maintenance, incident investigation, emergency planning, etc., this document discusses these elements only as they are affected by the ISA process. It does not provide detailed guidance about these elements. Nor does it address acceptance criteria for the ISA. Instead, these topics are addressed in the NUREG-1520 "Standard Review Plan for the Review of License Applications for Nuclear Fuel Cycle Facility."

In developing the ISA guidance for its licensees, NRC has relied on information from various sources, with particular emphasis on information in Guidelines for Hazard Evaluation Procedures Second Edition With Worked Examples, developed by the American Institute of Chemical Engineers (1992). This reference book contains descriptions of most ISA techniques currently in use.

NRC is also cognizant of regulations on Process Safety Management of Highly Hazardous Chemicals, developed by Occupational Safety and Health Administration (OSHA) (1992) and Risk Management Programs for Chemical Accidental Release Prevention, developed by EPA (1993). The ISA guidance in this document is intended to be consistent with the requirements of OSHA and EPA so as to minimize the regulatory burden on NRC licensees. It should be recognized, however, that the scope of NRC's concerns differs from those of OSHA and EPA. NRC is responsible for addressing radiological, nuclear criticality, and certain chemical hazards (e.g., UF<sub>6</sub> release) not covered under other regulations. Therefore, while it is anticipated that analyses done to satisfy requirements of OSHA and EPA may be useful, it is also expected that such analyses will need to be extended to address NRC requirements.

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### **Definition of ISA**

According to the revised Part 70, an integrated safety analysis means "a systematic analysis to identify plant and external hazards and their potential for initiating accident sequences, the potential accident sequences, their likelihood and consequences, and the site, structures, equipment, components, and activities of personnel that are relied on for safety. As used here, integrated means joint consideration of and protection from all relevant hazards including radiological, criticality, fire, and chemical."

### **Choosing an ISA Method**

The choice of a particular method or combination of methods will depend on a number of factors including the reason for conducting the analysis, the results needed from the analysis, the information available, the complexity of the process being analyzed, the personnel and experience available to conduct the analysis, and the perceived risk of the process.

To satisfy NRC requirements as defined in Part 70, the licensee/applicant should choose a method capable of identifying specific accident/event sequences in addition to the safety controls that prevent such accidents or mitigate their consequences.

Several methods and examples for use are discussed in the guidance document.

ISA, as the name implies, is intended to provide an "integrated" analysis of facility hazards. That is, the analysis should take into account interactions among different types of hazards. For example, the release and ignition of an explosive material (chemical/fire hazard) could affect the release of radioactive materials (radiological hazard). Indeed, the controls (sprinkler system) used to protect against one hazard (fire) may increase the likelihood of an accident involving a different hazard (criticality). The ISA should take into account the interactions of various hazards and controls, to ensure that the combination of controls proposed to address multiple hazards assures an acceptable level of overall risk.

The effort at integration of analysis results also applies to the case where the overall system analysis has been arbitrarily divided into several smaller sub-system analyses, to reduce complexity. In this case, care must be taken to avoid the inadvertent omission of domino or cascading effects. For example, a fire in one subsystem may spread to a second subsystem causing a release of toxic material. Each subsystem analysis should take into account the input and output of materials and energy that can affect and be affected by the other subsystems.

### **Results of the Analysis**

The results of an ISA consist of an identification of potential accidents, the consequences of the accidents and their likelihood of occurrence, and the controls (e.g., the structures, systems, equipment, components, and personnel) relied on to prevent the accidents from occurring or to reduce their consequences.

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### Documenting the ISA Results

NRC regulations (i.e., Part 70) require the licensee to document the performance and results of the ISA process to demonstrate that it was conducted using sound practices and that it comprehensively identifies the structures, systems, equipment, components, and personnel relied on for safe operations. Documentation of the ISA is also important in supporting good risk management decisions and in supporting other safety program activities such as maintaining accurate standard operating procedures, managing change (configuration management), investigating incidents, and conducting audits and inspections, etc. Finally, documentation is necessary to consolidate and maintain the results of the study for future use.

The ISA should include the:

- ❑ Time frame during which the analysis was performed.
- ❑ Description of the site and the facility.
- ❑ Description of the each process analyzed.
- ❑ Identification of the method or methods chosen to perform the ISA and explain the basis on which the choice was made.
- ❑ Important assumptions made in the analysis.
- ❑ Identification of the members of the team who performed the ISA and the basis on which the choice was made including experience and qualifications of team members.
- ❑ Description of accident sequences identified and consequences of those accidents.
- ❑ Safety controls and associated management controls that have been identified and implemented to prevent or mitigate the consequences of the identified accidents.

### NUREG-1520 "STANDARD REVIEW PLAN FOR THE REVIEW OF A LICENSE APPLICATION FOR A FUEL CYCLE FACILITY"

The Standard Review Plan (SRP) provides guidance to the staff reviewers in the Office of Nuclear Materials Safety and Safeguards who perform safety and environmental impact reviews of applications to construct, modify, and/or operate fuel cycle facilities.

Section 7.0, "Fire Safety", addresses the specific issues and criteria associated with fire prevention, protection, detection, and suppression.

### Purpose

The purpose of the standard review plan is to ensure that an applicant has appropriately analyzed the fire and explosion risks, which could effect the safety of licensed materials and thus present an increased radiological risk and provided mitigative systems and controls to protect the workers, the public health and safety, and the environment.

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### Areas of Review

Also, fire protection systems may include safety controls, e.g., items relied on for safety (IROFS); a BDC requirement; a DID; a combination of IROFS/BDC/DID; or the system may have no regulated safety role depending on the safety analyses and programs proposed by the licensee. This can affect the way such systems are reviewed and inspected.

A basic review includes five main areas:

1. Fire Safety Management
2. Fire Risk Identification
3. Facility Design
4. Process Fire Safety
5. Fire Protection Systems and Emergency Response

The review is conducted primarily by a fire protection reviewer. Secondary responsibility for review is by criticality, environmental, chemical safety, and physical security reviewers. Supporting reviewers may include regional or fuel facility inspection staff and the resident inspector. Table 1-1 shows the areas of fire safety to be reviewed and provides examples of related issues. In addition, it provides some questions to consider when reviewing the application. If any of the questions elicit a "No" response, then further information may need to be requested from the applicant.

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**Table 1-1. Fire Safety Review**

Areas of Review	Related Issues	Does the Application...
Fire Safety Management	<ul style="list-style-type: none"> <li>☐ Safety organization</li> <li>☐ Engineering review</li> <li>☐ Fire prevention</li> <li>☐ Inspection</li> <li>☐ Testing</li> <li>☐ Maintenance</li> <li>☐ Pre-fire plans</li> <li>☐ Qualifications</li> <li>☐ Drills</li> <li>☐ Training</li> </ul>	<ul style="list-style-type: none"> <li>☐ Document how fire safety is administered and assured at the licensed facility?</li> <li>☐ Reflect a commitment to assure the “items relied upon for safety” (IROFS) as identified in the Integrated Safety Analysis (ISA) summary are available and reliable?</li> <li>☐ Indicate that fire safety awareness among employees is maintained?</li> <li>☐ Indicate that transient ignition sources and combustibles are controlled?</li> <li>☐ Reflect that the facility maintains a readiness to extinguish or limit the consequences of fire?</li> <li>☐ Identify a senior level manager who has the authority and staff to ensure that fire safety receives appropriate priority?</li> <li>☐ Reflect a Plant or Fire Safety Review Committee staffed by different discipline managers to integrate plant modifications?</li> <li>☐ Indicate a day-to-day supervision of fire safety by an individual with sufficient practical fire safety experience in nuclear facilities?</li> <li>☐ Document the fire safety management measures in sufficient detail to identify their relationship to, and functions for, normal operations, anticipated (off-normal) events, and accident safety (i.e., items relied on for safety)?</li> </ul>
Fire Risk Identification	<ul style="list-style-type: none"> <li>☐ Fire Hazards Analysis</li> <li>☐ Integrated Safety Analysis</li> <li>☐ Review consequence and probability data</li> </ul>	<ul style="list-style-type: none"> <li>☐ Indicate that a Fire Hazard Analysis (FHA) has been conducted? If yes, does the FHA provide bounding credible fire scenarios for each process fire area with significant fire loading, then assess or model the consequences of an unmitigated fire?</li> <li>☐ Identify credible facility hazards for each process area?</li> <li>☐ Provide information in the ISA summary detailing how that fire hazard was considered and addressed (i.e., the management measures and/or items relied on for</li> </ul>

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**Table 1-1. Fire Safety Review**

Areas of Review	Related Issues	Does the Application...
		<p>safety) for each process such that the performance requirements in §70.61 are satisfied?</p> <ul style="list-style-type: none"> <li>☐ Provide in a summary of the FHA, a description, by fire area, of the fuel loading, fire scenarios, methods of consequence analysis, the consequences, and a description of the mitigative controls?</li> </ul>
Facility Design	<p>Information on:</p> <ul style="list-style-type: none"> <li>☐ Building construction</li> <li>☐ Fire areas</li> <li>☐ Life safety</li> <li>☐ Ventilation</li> <li>☐ Electrical system design</li> </ul> <p>Consideration of competing requirements among fire safety and security, criticality, and environmental concerns should be accounted for.</p>	<ul style="list-style-type: none"> <li>☐ Document the fire safety considerations used in the general facility design of the licensed facilities?</li> <li>☐ Address the methodology used for extinguishing fires in water exclusion areas?</li> <li>☐ Document fire water run-off containment?</li> <li>☐ Document the criteria used for worker egress and procedures for firefighter access?</li> <li>☐ Minimize combustible materials such as plexiglass and plastic duct work?</li> </ul>
Process Fire Safety	<p>Involves design consideration to prevent an accident or mitigate the consequences from using:</p> <ul style="list-style-type: none"> <li>☐ Process chemicals</li> <li>☐ Combustible metals</li> </ul>	<ul style="list-style-type: none"> <li>☐ Identify hazardous chemicals and their effect on fire safety?</li> <li>☐ Provide an incompatible chemical matrix?</li> <li>☐ Reduce flammability/increase ignition temperature of process chemicals (e.g., solvents)?</li> </ul>

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**Table 1-1. Fire Safety Review**

Areas of Review	Related Issues	Does the Application...
	<ul style="list-style-type: none"> <li>☐ Flammable and combustible liquids and gases</li> <li>☐ High temperature equipment</li> <li>☐ Hot cells and glove boxes</li> <li>☐ Laboratories</li> </ul>	
Fire Protection Systems and Emergency Response	The specified application of fire detection, alarm, and suppression systems, portable extinguishers, water supply, and emergency response organization	<ul style="list-style-type: none"> <li>☐ Document the fire detection, alarm, and suppression systems and emergency response organizations provided for licensed facilities?</li> <li>☐ Identify and list the items relied upon for fire safety in the ISA summary?</li> <li>☐ Describe the fire protection provided in all process areas?</li> <li>☐ Include a memorandum of understanding (MOU) between the applicant and the fire departments necessary for required protection?</li> </ul>

## Acceptance Criteria and Review Procedures

The review plan specifies the regulatory acceptance criteria for each of the areas of review illustrated in Table 1-1. Guidance is provided on how to determine whether the licensee has met the performance criteria. In addition, detailed procedures are provided to focus the reviewer on specific documents that will be used to verify adequate compliance with the requirements of 10 CFR 70 and the criteria specified in the SRP.

During the acceptance review, the primary reviewer evaluates the application for completeness as required by 10 CFR Part 70 regarding fire safety for fuel cycle facilities and whether necessary criteria in "Areas of Review" have been addressed. If significant deficiencies are identified in the application, the application should be returned or additional information should be requested before the start of the safety evaluation.

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During the safety evaluation, the primary and secondary reviewers evaluate the adequacy of the application to comprehensively describe the fire safety of the licensed activity as covered in "Areas of Review" and the commitments made to the criteria specified in "Acceptance Criteria." The staff may request the applicant or licensee to provide additional information or modify the submittal to meet the acceptance criteria.

Reviewers should note that National Fire Protection Association (NFPA) 801, standard for Fire Protection for Facilities Hazardous Radioactive Materials uses "administrative control" in a different sense than Part 70 and elsewhere in the SRP. In Part 70, an administrative control, which is a subset of items relied on for safety, is the human action necessary to meet safety performance requirements. It is supported by management measures (training, QA, procedures, etc) that ensure the action will be taken if needed. In NFPA 801, administrative controls are the training, qualifications, procedures, etc. behind the human action. These elements are "Management Measures" in Part 70.

### Evaluation and Findings

The reviewer verifies that the regulatory requirements and the SRP criteria are met through a variety of means including:

- Information provided by the applicant or licensee.
- Inspection of the applicant's facilities by staff or by third party.
- Independent assessments.

The reviewer documents the review in a Safety Evaluation Report (SER).

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### Learning Objective

When you finish this section, you will be able to:

- 1.1.2 Identify the inspection objectives stated in NRC Inspection Procedures 88054 and 88055.

### **NRC INSPECTION PROCEDURES 88054 (FIRE PROTECTION, TRIENNIAL) & 88055 (FIRE PROTECTION ANNUAL)**

Inspection Procedures (IP) 88054 (Fire Protection, Triennial) and IP 88055 (Fire Protection, Annual) include inspection objectives, requirements, and general guidance. Specific guidance is included for all 6 inspection requirements in IP 88054 (Fire Protection, Triennial) and 2 of the 3 inspection requirements in IP 88055 (Fire Protection, Annual). See Appendix B for complete versions of both documents.

#### **Inspection Objectives**

IP 88054 (Fire Protection, Triennial) has the following objectives:

Evaluate the licensee or certificate holder's fire protection capability from a programmatic design-based and risk-informed perspective to determine whether the following meet license or certificate requirements and are adequate to preclude or mitigate the consequences of a fire.

- ▣ Program for control of combustibles and ignition sources within the plant;
- ▣ Program to ensure adequate fire detection and suppression capability;
- ▣ Program to ensure that the material condition, design, and qualification testing of passive fire protection features is adequate;
- ▣ Program to ensure that compensatory measures will be in place for out-of-service, degraded or inoperable fire protection equipment, systems or features;
- ▣ Program to ensure that feasible and reliable emergency operating actions will be taken if required to mitigate the adverse affects of a fire;
- ▣ Program to assure that maintenance and facility changes continue to meet applicable codes and standards and license or certificate basis;

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- ❑ IP 88055 (Fire Protection, Annual) complements the triennial inspection by focusing on the design basis and operational status of the fire protection program specifically in the areas of active fire detection/suppression systems and passive fire confinement features including the adequacy of their design, maintenance, and operational performance. However, the inspector should consider the need for additional evaluations in these areas based on previous inspections and potential issues.

IP 88055 (Fire Protection, Annual) has the following objectives:

Evaluate the operational status and material condition of the licensee or certificate holder's fire protection systems to determine whether the following are adequate:

- ❑ Effectiveness of controls for combustibles and ignition sources within the plant;
- ❑ Operability of fire detection and suppression equipment and systems;
- ❑ The material condition of passive fire protection features;
- ❑ Effectiveness of compensatory measures in place for out-of-service, degraded or inoperable fire protection equipment, systems or features; and
- ❑ Performance of the fire brigade.

### Inspection Requirements and Guidance

See Appendix B for a complete description of the inspection requirements and guidance for both IP 88054 (Fire Protection, Triennial) and IP 88055 (Fire Protection, Annual).

The following guidance documents are provided in the Supplementary Reading that follows this module.

- ❑ “Standard Review Plan for the Review of an Application for a Mixed Oxide (MOX) Fuel Facility,” Section 7.0, “Fire Protection,” (NUREG-1718)
- ❑ “Standard Review Plan for the Recertification of the Gaseous Diffusion Plants,” Section 11.0, “Fire Safety” (NUREG-1671)
- ❑ “Standard Review Plan for the Review of a License Application for the Tank Waste Remediation System Privatization (TWRS-P) Project,” Section 7.0, “Fire Protection,” (NUREG-1702)

NUREG-1718 sets forth standards for a review of fire protection at a Mixed Oxide (MOX) facility. The SRP describes areas of review to give reasonable assurance that the facility provides for adequate protection against fires and explosions and adheres to 10 CFR Part 70.64(a)(3) and 70.64(b). The review should also establish that radiological consequences from fires are considered in determining how the facility will meet the performance requirements of 70.61. Personnel with responsibility for review are: the Fire Protection Engineer, Project Manager, Chemical Safety Reviewer, Nuclear Criticality Safety Reviewer, Quality Assurance Reviewer, and Physical Security Reviewer.

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NUREG-1671 provides review standards to ensure that the holder of the certificate for a gaseous diffusion plant (GDP) has demonstrated that proposed equipment, facilities, and procedures provide reasonable assurance of adequate fire safety sufficient to protect health and minimizes danger to life or property.

NUREG-1702 provides review standards for establishing reasonable assurance that there is adequate protection against fires and explosions in adherence to Part 70.64(a)(3) and is based on defense-in-depth practices as set forth in 70.64(b). This review should also establish that radiological consequences from fires are considered in determining how the facility will meet the performance requirements of 70.61. Personnel with responsibility for review are: the Fire Protection Engineer, Licensing Project Manager, Chemical Engineer, Nuclear Engineer, and Quality Assurance Engineer.

### SUMMARY

The regulatory requirements for fire protection are in 10 CFR 70, “Domestic Licensing of Special Nuclear Material.” NRC documents providing guidance on fire protection at fuel cycle facilities are summarized below.

- NRC Branch Technical Position 57 FR 35607, “Guidance on Fire Protection for Fuel Cycle Facilities”

NRC issued the BPT to address important safety concerns. The document serves as a source of information on the equipment, facilities, and procedures used to provide reasonable assurance of fire safety for fuel cycle facilities. The BTP introduces the concept of the FHA to identify deficiencies in the fire protection program of a facility.

- NUREG-1513, “Integrated Safety Analysis Guidance Document”

The revised rule for 10 CFR 70 was issued to include a requirement for certain licensee/applicants to conduct an ISA and provide guidance on how to perform an ISA. The document describes what constitutes an integrated analysis of facilities hazards and instructions for documenting the results.

- NUREG-1520, “Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility”

The SRP provides guidance to reviewers who perform safety and environmental impact reviews of applications to construct, modify, and/or operate fuel cycle facilities. Section 7.0, “Fire Safety,” addresses the specific issues and criteria associated with fire prevention, protection, detection, and suppression. Five areas included in a review are: Fire Safety Management, Fire Risk Identification, Facility Design, Process Fire Safety, and Fire Protection Systems and Emergency Response.

- NRC Inspection Procedure 88054/55, “Fire Protection” (Triennial/Annual)

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These inspection procedures provide inspection objectives, requirements, and general guidance. See complete documents in Appendix B.

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### Activity 1 – NRC Regulatory and Guidance Documents

INSTRUCTIONS: Complete the following activity. Match one of the five documents listed in column A with the items listed in column B. Answers are located in the answer key section of this module.



#### Column A – Document

#### Column B - Item

- |   |   |
|---|---|
| A. 10 CFR 70<br>"Domestic<br>Licensing of<br>Special Nuclear<br>Material"   | 1. ____ You, as an inspector, would like to verify that the licensee has adequately addressed the issues associated with certain fire protection features and systems such as alarm systems and passive fire-rated barriers. In addition, you want to determine whether the licensee has met the regulatory acceptance criteria and the performance criteria specified in this document.  |
| B. NRC Branch<br>Technical Position<br>57 FR 35607,<br>"Guidance on Fire<br>Protection for Fuel<br>Cycle Facilities"      | 2. ____ You would like some general guidance on what to look at when you conduct your fire protection inspection at a uranium enrichment plant. You are particularly interested in the assessment of equipment and facilities.<br><br>3. ____ The licensee wants to review the regulatory requirement governing fire protection. You provide the licensee with a copy of this document.   |
| C. NUREG-1513,<br>"Integrated Safety<br>Analysis Guidance<br>Document"  | 4. ____ You include a review of documentation in your inspection plan. You want some guidance on what to review to assess adequate implementation of a fire protection program.   |
| D. NUREG-1520,<br>"Standard Review<br>Plan for the<br>Review of a<br>License<br>Application for a<br>Fuel Cycle Facility" | 5. ____ You want to review the guidance provided by the NRC on acceptable fire protection programs and the elements necessary to support the fire protection concept of balancing fire prevention, fire detection, and fire containment and suppression.<br><br>6. ____ You are preparing to conduct a fire protection inspection at a fuel fabrication plant. You want to ensure that you have covered all 10 inspection requirements. |
| E. NRC Inspection<br>Procedure 88055,<br>Fire Protection  | 7. ____ The licensee provides you with a systematic analysis to identify hazards and their potential for initiating accident sequences, the potential accident sequences, their likelihood and consequences, and the site, structures, equipment, components, and activities of personnel that are relied on for safety.  |

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### Self-Check Questions 1-1

INSTRUCTIONS: Complete the following questions by selecting the best response. Answers are located in the answer key section of this module.



1. The purpose of the Branch Technical Position, "Guidance on Fire Protection for Fuel Cycle Facilities," Federal Register 57 FR 35607, is to:
  - A. Serve as a source of information on the features of equipment, facilities, and procedures that can be used to provide reasonable assurance of fire safety at fuel cycle facilities.
  - B. Specify the requirements for implementing fire protection programs at NRC-licensed facilities.
  - C. List the criteria that will be used to determine compliance with NRC requirements and specifications for fire safety.
  - D. Formalize the procedures for selection of fire protection equipment and construction of facilities.
  
2. The purpose of NUREG-1513, "Integrated Safety Analysis Guidance Document" is to:
  - A. Determine the costs of conducting an ISA.
  - B. Provide detail guidance about training, maintenance, incident investigation, and emergency planning.
  - C. Provide guidance to NRC fuel cycle licensee/applicants on how to perform an ISA and document the results.
  - D. Provide acceptance criteria for an ISA.

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3. NUREG -1520, Section 7.0, "Fire Safety," has as its stated purpose:
  - A. List the characteristics of fire protection programs recommended by the NRC, National Fire Protection Association (NFPA), state and local governments, and other regulatory agencies.
  - B. Define the specific fire protection training requirements and qualification standards for fuel cycle facility fire protection specialists.
  - C. Designate specific fire protection duties and responsibilities to the Licensee's Fire Brigade.
  - D. Ensure that the licensee has demonstrated that the proposed equipment, facilities, and procedures provide assurance of adequate fire safety sufficient to protect health and minimize danger to life or property.
  
4. One of the inspection objectives stated in NRC Inspection Procedure 88055 is to determine:
  - A. If there is an increase in the number of fire incidents over the previous five years.
  - B. If the facility's periodic fire-fighting equipment inspections are meeting NRC-required inspection and maintenance schedules.
  - C. Whether a licensee has in place an adequate Pre-Fire Plan and maintains personnel and equipment in readiness to implement the plan.
  - D. Whether the licensee has conducted and documented all NRC-required fire and fire-related refresher training for the facility's fire protection personnel.

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**You have completed this module.  
Schedule an appointment with your administrator before you go any further.**

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### ANSWER KEY

#### Activity 1: NRC Guidance Documents

1. D
2. E
3. A
4. E
5. B
6. E
7. C

#### Self-Check Questions 1-1

1. **A. Correct!**
  - B. Incorrect. The NRC Branch Technical Position does not specify any requirements for fire protection programs.
  - C. Sorry. The NRC does not have specific requirements and specifications for fire safety.
  - D. Wrong answer. The NRC Branch Technical Position does not describe procedures for selecting fire protection equipment or construction.
2.
  - A. No. The ISA's main purpose is not to discuss costs.
  - B. Incorrect. Detailed guidance of these elements are not addressed. These elements are discussed only as they are affected by the ISA process.
  - C. Correct! Way to go!**
  - D. Sorry. Acceptance criteria is addressed in the "Standard Review Plan for the Review of License Applications for Nuclear Fuel Cycle Facilities under 10 CFR part 70."
3.
  - A. Incorrect. The NRC does not establish required characteristics for fire protection programs.
  - B. Sorry. NUREG-1520 does not define training or qualification standards.
  - C. Wrong answer. The NUREG-1520 does not designate duties and responsibilities for a licensee's fire brigade.
  - D. Congratulations! You have selected the right answer.**

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4.
  - A. Sorry. The NRC does not use the Inspection Procedure to gather statistical data.
  - B. Wrong answer. The NRC does not have specific required inspection and maintenance schedules.
  - C. Right!**
  - D. Incorrect. The NRC does not have a specific requirement for refresher training for fire protection personnel.