

## ATTACHMENT 71111.05XT

INSPECTABLE AREA: Fire Protection - NFPA 805 (Triennial)

CORNERSTONE: Initiating Events  
Mitigating Systems

EFFECTIVE DATE: January 1, 2012

INSPECTION BASES: Fire can be a significant contributor to plant risk. In many cases, the risk posed by fires is comparable to or exceeds the risk from internal events. The fire protection program (FPP) shall extend the concept of defense in depth (DID) to fire protection in plant areas important to safety by:

- (1) preventing fires from starting,
- (2) rapidly detecting, controlling, and extinguishing fires that do occur,
- (3) providing protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by fire suppression activities will not prevent essential plant safety functions from being performed.

Risk-informed, performance-based fire protection is based on established goals, objectives, and performance criteria against which the FPP is measured.

Licensees are also expected to take reasonable actions to mitigate postulated events that could potentially cause loss of large areas of power reactor facilities as the result of explosions or fires. Interim Compensatory Measures Order EA-02-026 spanned a wide range of security-related actions required to be taken by power reactor licensees in response to the events of September 11, 2001. Section B.5.b of the Order dealt specifically with these postulated events. In response to this Order (and the subsequent requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.54 (hh)(2)) licensees implemented alternative mitigating strategies intended to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities under such circumstances. These are collectively referred to as B.5.b requirements.

**LEVEL OF EFFORT:** Every 3 years, an inspection team will conduct an onsite inspection of the licensee's risk-informed, performance-based FPP relative to the elements for preventing and mitigating the consequences of a fire. The review should also examine the plant's capability to meet the requirements of the NRC-approved fire protection program, and the nuclear safety and radioactive release goals, objectives and performance criteria of National Fire Protection Association (NFPA) Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generation Plants," 2001 Edition. The effort will also include a review of the licensee's FPP problem identification and resolution.

In addition, every 3 years inspectors trained to review alternative mitigating strategies will review several mitigating strategies to ensure they remain feasible. Additionally, inspectors will review the storage, maintenance, and testing of B.5.b related equipment.

#### 71111.05-01 INSPECTION OBJECTIVES

01.01 The inspection team will evaluate the licensee's FPP from the perspectives of design, installation, operational status, testing, and material condition to verify that the licensee's program is sufficiently implemented and maintained to satisfy the nuclear safety and radioactive release goals, objectives, and performance criteria for all operational modes and plant configurations by verification of the following:

- a. Fire Prevention Program controls for combustibles and ignition sources within the plant are developed and effectively implemented to satisfy the FPP performance requirements of NFPA 805 (see NFPA 805, Sections 3.3.1.2 and 3.3.1.3).
- b. Fire alarm, detection and fire suppression systems required to meet the nuclear safety performance criteria are designed, installed and tested to the applicable NFPA codes of record and the licensing basis, and have sufficient capability and effectiveness to satisfy the FPP performance requirements of NFPA 805 (see NFPA 805, Sections 3.5, 3.6, 3.7, 3.8, 3.9 and 3.10).
- c. Passive fire protection features required to meet the nuclear safety performance criteria are designed and installed per NFPA codes of record and the licensing basis, and have sufficient capability and effectiveness to satisfy the FPP performance requirements of NFPA 805 (see NFPA 805, Section 3.11).
- d. Compensatory measures in place for out-of-service, degraded or inoperable fire protection and nuclear safety equipment, systems or features provide reasonable assurance that the necessary function is compensated for (see

NFPA 805, Sections 1.6.8 and 3.2.3(2)).

- e. Nuclear safety capability, as determined by one success path necessary to achieve the nuclear safety performance criteria is free of fire damage by a single fire, is effective in achieving the performance criteria of NFPA 805.
- f. Recovery actions and repairs required to demonstrate the availability of a success path to achieve the nuclear safety performance criteria are feasible and have been evaluated for the additional risk due to their use.
- g. Monitoring, documentation, quality, maintenance, and administrative control of engineering analyses and related assumptions that support performance-based fire protection design and operation, including the plant change evaluation process and monitoring program are adequate and accurate to ensure sufficient safety margins are maintained as outlined in NFPA 805. Verify that procedures exist and are being followed to audit all other facility FPP attributes, such as operator training, hot work, and performance of regular facility inspections (see NFPA 805, Sections 3.2.3(3), 2.6, and 2.7).
- h. Licensee analysis performed to evaluate whether radiation release to any unrestricted area as the result of direct effects of fire suppression activities (but not involving fuel damage) is as low as reasonably achievable and does not exceed the applicable limits of 10 CFR Part 20, "Standards for Protection Against Radiation" (see NFPA 805, Section 1.5.2).

Inspection Procedure (IP) 71111.05AQ, "Fire Protection (Annual/Quarterly)," is designed to complement the triennial inspection specifically in the areas of fire brigade capability and water supply and delivery system maintenance and adequacy. However, the team should consider the need for additional evaluations in these areas based on previous assessments of licensee performance and any potential issues identified in these assessments.

01.02 The inspection team will verify that B.5.b mitigating strategies are feasible in light of operator training, maintenance of necessary equipment, and any plant modifications.

## 71111.05-02 INSPECTION REQUIREMENTS

### 02.01 Inspection Preparation.

- a. Fire Areas. Every 3 years, an inspection team will select an appropriate number of fire areas/zones (considering team makeup, scope, and resources) and conduct a risk-informed inspection of the licensee's FPP. The team leader should consider the following when selecting areas to be inspected. If available select one fire area that is performance based, one fire area that is deterministic based, and one fire area that has a primary control station. The number of fire

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areas inspected can be adjusted during the inspection based on the complexity of the developing issues reviewed by the inspection team.

Risk-informed, performance-based fire protection relies on engineering analyses (e.g., risk assessment, fire modeling, and other engineering evaluations) to demonstrate the acceptability of fire protection systems and features to meet performance requirements, and the capability of the plant design and operation to meet the nuclear safety and radioactive release performance criteria of NFPA 805. While extensive review of engineering analyses is not required as part of the inspection, the team should review the analytical methods, application of resulting plant change evaluations, quality and maintenance of these analyses, and related assumptions to the extent necessary to support the inspection objectives.

Special focus of the inspection should be on capability to meet nuclear safety and radioactive release goals under any mode of plant operation, and if applicable, include fire areas that rely on risk-informed, performance-based analyses to demonstrate performance criteria are met. Where plant changes have been made that could impact the plant's capability to meet the nuclear safety and radioactive release performance criteria, the inspection team should consider reviewing the licensee's change evaluation process in addition to a selection of recently implemented plant change evaluations that have been performed in the fire areas selected for inspection to verify these changes have been evaluated and incorporated in the FPP. The licensee's process for monitoring of FPP performance, including maintaining the validity of analytical assumptions in engineering analyses, and the assumed reliability and availability of fire protection systems and features should also be reviewed.

Verify that licensee risk-informed, performance-based alternatives to the requirements of NFPA 805 are approved by a safety evaluation (SE) in accordance with 10 CFR 50.48(c)(2)(vii).

The initial selection of fire areas to be inspected should consider inputs from a senior reactor analyst (SRA), a reactor systems specialist, a fire protection specialist, an electrical/instrumentation and control specialist, and other disciplines and personnel (e.g., resident inspectors) as appropriate. The selection process for each fire area should consider, but not be limited to, the following:

1. Licensee use of engineering analyses (e.g., risk assessment and fire modeling) in lieu of deterministic methods to establish the acceptability of fire protection features and the capability to meet nuclear safety performance criteria for reactivity control, inventory and pressure control, decay heat removal, vital auxiliaries and process monitoring (see NFPA 805, Section 1.5.1)
2. Potential ignition sources

3. Configuration and characteristics of in situ and transient combustible materials
  4. Configuration of SSD components, including related cable types, routing configurations, and damage thresholds of circuits important to the capability to meet the nuclear safety goals, objectives, and performance criteria (see Regulatory Issue Summary 2004-03, "Risk-Informed Approach for Post-Fire Safe-Shutdown Circuit Inspections," for other risk factors related to circuits)
  5. Licensee's fire protection and firefighting capability, including accessibility for manual firefighting
  6. Licensee's use of recovery actions, including repairs for nuclear safety capability systems and components
  7. Plant changes that impact the FPP
  8. Risk significance of the fire area or zone
  9. Other information such as past inspection results and generic issues and operational experience relevant to the areas/zones being inspected.
- b. B.5.b Mitigating Strategies. As part of the team's inspection of fire protection issues, a review of B.5.b Mitigating Strategies will also be performed. The team should select one or more strategies to review; and part of this review should include a review of the storage, maintenance, and testing of B.5.b related equipment. When determining which strategies and equipment to review, the team should consider the following:
1. Strategies for which the licensee has modified the regulatory commitment since the last performance of this inspection (or the performance of Temporary Instruction 2515/171, "Verification of Site Specific Implementation of B.5.b Phase 2 & 3 Mitigating Strategies"). Any such strategies should be the main focus of the inspection effort.
  2. Complexity of the strategies.
  3. Risk significance of the strategies.
  4. Strategies from different categories. For the purpose of this inspection the mitigating strategies are broadly characterized as firefighting, command and control, spent fuel pool, and reactor and containment related.

02.02 Fire Protection Inspection Requirements. This inspection verifies that the systems required to achieve and maintain safe and stable plant conditions following a

fire in any plant operating mode or configuration are capable of meeting the nuclear safety and radioactive release goals, objectives, and performance criteria. It also verifies that the licensee's engineering and/or licensing justifications (e.g., NRC guidance documents, license amendments, technical specifications, SEs, exemptions, deviations) support the appropriate selection of the designated systems/equipment and associated support functions.

The team will evaluate fixed fire protection systems and features including installation, design, testing, and effective performance (where applicable) to control and/or suppress fires associated with the hazards of each selected area against the code-of-record, applicable license bases (e.g., NRC SEs), or other licensee engineering evaluations.

If a fire brigade drill is observed, the team should consider the lines of inspection inquiry discussed in IP 71111.05AQ.

a. Protection of Safe-Shutdown Capabilities.

Verify that in the event of a fire, an SSD success path, free of fire damage, will be available to meet the nuclear safety goals, objectives and performance criteria for a fire under any plant operational mode or configuration (see NFPA 805, Section 4.2.1).

NFPA 805 section 4.2.3.1 states that use of recovery actions to demonstrate availability of a success path for the nuclear safety performance criteria automatically shall imply use of the performance-based approach. Recovery actions credited to achieve the nuclear safety performance criteria shall be feasible. Recovery action feasibility should be evaluated against the criteria established in the licensee's fire protection program as approved in the risk-informed, performance-based fire protection program safety evaluation.

b. Passive Fire Protection.

Verify through observation of material condition that the fire ratings of fire area boundaries, raceway fire barriers, and equipment fire barriers required by NFPA 805, Chapter 4, appear to meet the fundamental design requirements of NFPA 805, Section 3.11. Where necessary, verify that the licensee has performed engineering equivalency evaluations to justify levels of protection equivalent to, or different than, those specified in the requirements.

Verify through review of installation and repair records that material of an appropriate fire rating (equal to the overall rating of the barrier itself) has been used to fill openings and penetrations and that the installation meets engineering design.

Verify through review of installation or repair records that material of an appropriate fire rating has been used as fire protection wraps, that the installation meets engineering design and standard industry practices, and that it

was either properly evaluated or qualified by appropriate fire endurance tests (see NFPA 805, Section 3.11.5). Sample completed surveillance and maintenance procedures for selected fire doors, fire dampers, and fire barrier penetration seals to ensure they were properly inspected and maintained (see NFPA 805, Section 3.11.3).

For unusual installation configurations and/or application of unusual materials verify appropriate fire test data.

c. Active Fire Protection.

Verify and review the material condition, operational lineup, operational availability, and design of fire detection systems, fire suppression systems, manual fire fighting equipment, and fire brigade capabilities (See NFPA 805 Sections 3.4, 3.5, 3.6, 3.8, 3.9 and 3.10).

Verify that detection and automatic and manual suppression systems are installed, tested, and maintained in accordance with the fundamental design requirements of NFPA 805, Sections 3.9 and 3.10 as applicable, the code-of-record and/or the specific plant licensing basis, and would adequately control and/or extinguish fires associated with the hazards of each selected area. Where necessary, verify the licensee has performed engineering equivalency evaluations to justify levels of protection equivalent to, or different than, those specified in the requirements.

Verify and review the material condition, operational lineup, operational effectiveness, and design of standpipe and hose stations (see NFPA 805, Section 3.6).

Compare the fire brigade preplan strategies with as-built plant conditions and fire response procedures. This review is done to verify that the fire fighting preplan strategies and drawings are consistent with the fire protection features and potential fire conditions described in the FPP (see NFPA 805, Section 3.4.2)

Verify that the licensee has established appropriate controls for fire extinguishers (see NFPA 805, Section 3.7).

d. Protection from Damage from Fire Suppression Activities.

Verify that one success path necessary to achieve and maintain the nuclear safety performance criteria is maintained free of fire damage by a single fire.

Verify that the effects of fire suppression activities, including the rupture or inadvertent operation of fire suppression systems, on the ability to achieve the nuclear safety performance criteria have been evaluated (see NFPA 805, Sections 2.5.(3), 3.6.3, 3.10.9 and 4.2.1).

Verify that the licensee has addressed each of the following:

1. A fire in a single location that may, indirectly, through the production of smoke, heat, or hot gases, cause activation of automatic fire suppression system(s) that could potentially damage the success path necessary to achieve and maintain the nuclear safety performance criteria.
  2. A fire in a single location that may result in the use of a manually activated fire suppression system that may indirectly cause damage to the success path necessary to achieve and maintain the nuclear safety performance criteria.
  3. The inadvertent actuation of an automatic or manual fire suppression system or the rupture of a fire suppression system that may indirectly cause damage to the success path necessary to achieve and maintain the nuclear safety performance criteria.
  4. Adequate drainage is provided in areas protected by water suppression systems.
- e. Shutdown from a Primary Control Station.

A primary control station(s) is a dedicated shutdown or alternative shutdown control location, which has been reviewed and approved by the NRC. These areas become primary control stations when command and control is shifted from the main control room to these locations. See Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," Regulatory Position 2.4.

1. Methodology.

Verify that the licensee's nuclear safety capability assessment has properly identified the components and systems necessary to meet the nuclear safety performance criteria for each fire area selected for review. Specifically, determine the adequacy of the systems selected to meet the criteria for reactivity control, inventory and pressure control, decay heat removal, vital auxiliaries, and process monitoring (see NFPA 805, Section 1.5.1).

If the above performance criteria are not met, review the licensee's engineering evaluations and/or licensing justifications (e.g., NRC guidance documents, license amendments, technical specifications, SEs, exemptions, or deviations) to determine if the licensee has established an acceptable alternative approach or other technical basis for not meeting the specific criteria.

For any primary control station(s) that were previously approved by the



NRC staff under the pre-transition licensing basis, verify that safe and stable conditions can be achieved and maintained from the primary control station with or without the availability of offsite power. For any primary control station(s) that the licensee has decided to analyze using a performance-based approach, verify that the performance-based analysis includes consideration of all necessary cables and equipment associated with operation and control of off-site power.

Verify that the transfer of command and control from the control room to the primary control station has been demonstrated to be unaffected by fire-induced circuit faults (e.g., by the provision of separate fuses and power supplies for shutdown control circuits).

2. Operational Implementation.

Verify that recovery actions being taken to respond to fires in the selected fire areas are feasible. Feasibility should be evaluated against the criteria established in the licensee's program as submitted and approved in the risk-informed, performance-based fire protection program safety evaluation.

Verify that the training program for licensed and non-licensed personnel includes procedures for meeting nuclear safety performance criteria necessary to achieve and maintain post-fire safe and stable plant conditions, including necessary recovery actions.

Verify that personnel required to achieve and maintain safe and stable plant conditions are properly trained and are available at all times among the normal onsite staff, exclusive of the fire brigade.

Verify that adequate procedures to achieve and maintain safe and stable plant conditions exist, including reliable steps to implement all recovery actions.

Verify the implementation and human factors adequacy of the procedures to achieve and maintain safe and stable plant conditions by independently "walking through" the procedural steps.

Verify by walkdown that the operators can reasonably be expected to perform the procedures within applicable time requirements to achieve nuclear safety performance criteria.

Verify that the licensee conducts periodic operational tests of the transfer and isolation capability and instrumentation and control functions used for transferring control from the main control room or other primary control station(s). Also verify that the tests are adequate to prove the functionality of the primary control station(s) capability to meet performance criteria and

achieve and maintain safe and stable plant conditions.

For recovery actions necessary to meet nuclear safety performance criteria, verify the availability of supporting systems and equipment. The inspector should verify these supporting capabilities as applicable to the areas under review.

f. Circuit Analyses.

Regulatory Guide 1.205 endorses Chapter 3 of Nuclear Energy Institute (NEI) 00-01, Revision 2, "Guidance for Post-Fire Safe Shutdown Analysis," which provides one acceptable approach to circuit analysis for a plant implementing a FPP under 10 CFR 50.48(c).

Verify that the licensee has identified circuits required for nuclear safety functions and that they are protected in accordance with the deterministic approach, or the identified circuits have been evaluated using an acceptable risk-informed, performance-based approach and appropriate levels of protection have been provided based on the conclusions of the analyses.

Verify for the selected areas that the licensee has performed circuit analyses that demonstrate the nuclear safety capability is available to meet the performance criteria.

Verify that the licensee's analysis identifies circuits that may impact nuclear safety performance criteria. The analysis should demonstrate that hot shorts, shorts to ground or other failures that would result in a spurious actuation will not affect the capability to meet the performance criteria.

Verify that the licensee's analysis determined the potential consequence(s) of cable failures in the area being evaluated. Review the plant-specific process and instrumentation diagrams for flow diversions, loss of coolant, or other equipment failures that could significantly impair the plant's capability to meet nuclear safety performance criteria. When determining the potential consequence of such failures, consider the time at which the prevented operation or malfunction occurs relative to the timing necessary to accomplish nuclear safety functions.

g. Communications.

Verify, through inspection of the contents of designated emergency storage lockers and review of emergency control station alternative shutdown procedures, that portable radio communications and/or fixed emergency communications systems are available, operable, and adequate for the performance of the designated activities. Assess the capability of the communication systems to support the operators in the conduct and coordination of their required actions (e.g., consider ambient noise levels, clarity

of reception, reliability, and coverage patterns). If specific issues arise relating to alternative or dedicated shutdown communications adequacy, then, observe a licensee-conducted communications test in the subject plant area or areas.

Verify that a fire would not affect communications equipment such as repeaters, transmitters, etc.

h. Emergency Lighting.

Review emergency lighting provided, either in fixed or portable form, along access routes and egress routes, at control stations, plant parameter monitoring locations, and at recovery action locations:

1. If emergency lights are powered from a central battery or batteries, verify that the distribution system contains protective devices so that a fire in the area will not cause loss of emergency lighting in any unaffected area needed for SSD operations.
2. Verify that battery power supplies have a capacity sufficient to support recovery actions necessary to meet the nuclear safety performance criteria.
3. Verify that illumination is sufficient to permit access to and verification of components for the monitoring of SSD indications and/or the proper operation of SSD equipment.
4. Verify that the operability testing and maintenance of the lighting units follow licensee procedures and accepted industry practice.
5. Verify that emergency lighting unit batteries are being maintained consistent with the manufacturer's recommendations.

i. Cold Shutdown Repairs.

If required by analysis (the licensee has established cold shutdown as the required safe and stable end point), verify that the licensee has dedicated repair procedures, equipment, and materials to repair damaged components required to meet the nuclear safety performance criteria. Verify that these components can be made operable and that the performance criteria can be achieved within allowable time frames established by analysis. Verify that the repair equipment, components, tools, and materials (e.g., pre-cut cable connectors with prepared attachment lugs) are available and accessible on site.

j. Compensatory Measures.

Verify that compensatory measures are in place for out-of-service, degraded, or inoperable fire protection and success path equipment, systems, or features

(e.g. detection and suppression systems and equipment, passive fire barriers, or pumps, valves or electrical devices providing nuclear safety functions or capabilities for meeting performance criteria) necessary to achieve and maintain safe and stable plant conditions (see NFPA 805, Sections 1.6.8 and 3.2.3.(2)). Short-term compensatory measures should compensate for the degraded function or feature until appropriate corrective action can be taken.

k. Radiological Release.

The radioactive release goal is to provide reasonable assurance that a fire will not result in a radiological release that adversely affects the public, plant personnel, or the environment (see NFPA 805, Section 1.3.2). Either of the following objectives shall be met during all operational modes and plant configurations: (1) containment integrity can be maintained, or (2) the source term can be limited. (see NFPA 805, Section 1.4.2)

Verify that the licensee has evaluated that any radiation release to any unrestricted area that results from the direct effects of fire suppression activities (but not involving fuel damage) shall be as low as reasonably achievable and shall not exceed applicable 10 CFR Part 20 limits (see NFPA 805, Section 1.5.2).

Verify that the licensee analysis of radioactive release has been examined on a fire area basis (see NFPA 805, Section 2.2.4).

l. Non Power Operations.

If, during the inspection, the plant enters an outage, verify that the licensee has implemented the FPP controls during non-power operational modes. Verify that the licensee has performed the following in accordance with plant procedures and processes:

1. Defined any higher risk evolutions being performed during the outage.
2. Defined the key safety functions (KSFs) required to maintain the plant in a safe and stable condition during non-power operational modes.
3. Performed the Nuclear Safety Capability Assessment during non-power operations and defined specific pinch points where one or more KSFs could be lost.
4. Established additional fire protection defense-in-depth actions to be taken during high risk evolutions in the location(s) of the pinch points where KSFs could be lost.

m. Monitoring Program.

Verify that the licensee has established a monitoring program that ensures that the availability and reliability of the fire protection systems and features credited in the performance-based analyses are maintained and to assess the performance of the fire protection program in meeting the performance criteria (see NFPA 805, Section 2.6).

Verify that the monitoring program ensures that the assumptions in the engineering analysis remain valid.

Verify that the licensee is maintaining the acceptable levels of availability, reliability, and performance as per its license condition (see NFPA 805, Section 2.6.1).

When the established levels of availability, reliability, and performance are not met, verify that the licensee has appropriate corrective actions to return to the established levels. Monitoring shall be continued to ensure that the corrective actions are effective in restoring availability, reliability, and performance to the established levels (see NFPA 805, Section 2.6.3).

n. Plant Change Evaluation.

Where performance-based methods are applied, verify the methods (e.g., fire models, risk assessment) adequately represent plant design and conditions in the fire area, are performed by qualified persons, are acceptable for the application and meet the requirements of the fire protection license condition for self approved changes to the FPP.

02.03 B.5.b Inspection Activities. Review one sample of the licensee's preparedness to handle large fires or explosions by reviewing one or more mitigating strategies. This review should verify that the licensee continues to meet the requirements of their B.5.b related license conditions and 10 CFR 50.54 (hh)(2) by determining that:

- a. Procedures are being maintained and are adequate.
- b. Equipment is properly staged and is being maintained and tested.
- c. Station personnel are knowledgeable and can implement the procedures.

02.04 Identification and Resolution of Problems. The team should verify that the licensee is identifying issues related to this inspection area at an appropriate threshold and entering the issues in the corrective action program. For a sample of selected issues documented in the corrective action program, verify that the corrective actions are appropriate. See IP 71152, "Identification and Resolution of Problems," for additional guidance.

## 71111.05-03 INSPECTION GUIDANCE

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### 03.01 Inspection Preparation.

- a. Inspection Team. The team assigned to conduct the multidisciplinary triennial fire protection inspection should include a fire protection inspector, an electrical/circuit analysis inspector, a reactor systems/mechanical systems inspector, and other personnel with the necessary experience and background to perform the inspection.
  1. Reactor Operations. The inspector knowledgeable in this area will assess the capability of reactor and balance-of-plant systems, equipment, operating personnel, and procedures to achieve and maintain post-fire SSD and minimize the release of radioactivity to the environment in the event of fire. Therefore, the inspection team leader will ensure that the inspector is knowledgeable regarding integrated plant operations, maintenance, testing, surveillance and quality assurance, reactor normal and off-normal operating procedures, and boiling-water reactor and/or pressurized-water reactor nuclear and balance-of-plant systems design.
  2. Electrical Inspections. The inspector knowledgeable in this area will identify electrical separation requirements for redundant train power, control, and instrumentation cables. The inspector will review alternative shutdown panel electrical isolation design to establish the panel's electrical independence from postulated fire areas. Therefore, the inspection team leader will ensure that the inspector is knowledgeable regarding reactor plant electrical and instrumentation and control design and is familiar with industry ampacity derating standards.
  3. Fire Protection. The inspector knowledgeable in this area will work with other team members in determining the effectiveness of the fire barriers and systems that establish the reactor plant's post-fire SSD configuration and maintain it free of fire damage. The inspector will determine whether suitable fire protection features (suppression, separation distance, fire barriers, etc.) are provided for the separation of equipment and cables required to ensure plant safety. Therefore, the inspection team leader will ensure the inspector is knowledgeable regarding reactor plant fire protection systems, features, and procedures.
  4. B.5.b Mitigating Strategies. The inspector knowledgeable in this area will work with other team members to identify which alternative mitigating strategies should be reviewed. The inspector will determine if these strategies remain feasible. Therefore, the inspection team leader will ensure that the inspector is knowledgeable regarding B.5.b mitigating strategies.
- b. Regulatory Requirements and Licensing Bases. The regulatory requirements and licensing bases against which the post-fire capability is assessed are as

follows:

1. Title 10 of the Code of Federal Regulations (10 CFR), Part 50. 10 CFR 50.48(a), "Fire Protection," requires each operating nuclear power plant to have a fire protection plan which satisfies the requirements of Criterion 3 of Appendix A to 10 CFR Part 50. The NRC has identified that an acceptable plan is one that meets the requirements of 10 CFR 50.48(c), which incorporates by reference the 2001 edition of NFPA 805, with exceptions, modifications, and supplementations (as detailed in 10 CFR 50.48(c)).
  2. Regulatory Guide 1.205. Regulatory Guide 1.205 provides the methods acceptable to the Commission for meeting the requirements of NFPA 805. The Regulatory Guide endorses NEI 04-02, Revision 2, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program under 10 CFR 50.48(c)." See Section C of Regulatory Guide 1.205 for clarifications of the guidance provided in NEI 04-02, as well as NRC exceptions to the guidance. Regulatory Guide 1.205 also endorses Chapter 3 of NEI 00-01, Revision 2. See Section 3.3 of Regulatory Guide 1.205 for clarifications of the guidance provided in NEI 00-01.
  3. NEI 04-02. NEI 04-02, Revision 2 provides an approach for a licensee to make the transition from an existing FPP (e.g, a program meeting 10 CFR 50.48(b) and Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," to 10 CFR Part 50 or a specific fire protection license condition) to a program that meets 10 CFR 50.48(c).
  4. NEI 00-01. NEI 00-01, Revision 2, Chapter 3 provides one acceptable approach to circuit analysis for a plant implementing a FPP under 10 CFR 50.48(c).
  5. Changes to the FPP. Licensees must evaluate changes to the FPP, or changes to the plant that might impact the FPP, by using a plant change evaluation process that meets the requirements of NFPA 805, Sections 2.2.9 and 2.4.4. Regulatory Guide 1.205 and NEI 04-02, Revision 2 provide guidelines for implementing the process and the basis for determining if the changes can be licensee approved or will require approval by the NRC
- c. Licensee Notification and Information Gathering.
1. Licensee Notification Letter. The letter should discuss the scope of the inspection, request an information-gathering visit to the licensee reactor site or engineering offices, discuss documentation and licensee personnel availability needs during the onsite inspection weeks, and request a pre-inspection conference call to discuss administrative matters and finalize

inspection activity plans and schedules. Attachment 1 provides a template for a notification letter from the NRC to the licensee concerning the triennial fire protection baseline inspection.

2. Information-Gathering Site Visit. In advance of the information-gathering site visit, the team leader should provide the licensee with a list of information and documents that may be needed for the team to prepare for and conduct the triennial inspection, as well as a list of any planned requests for licensee-conducted evolutions (e.g., emergency lighting tests, communication tests, fire drills, shutdown walkthroughs including recovery actions, etc.).

Before the inspection information-gathering trip, the team leader should contact the regional senior reactor analyst (SRA) to obtain a summary of plant-specific fire risk insights (e.g., fire risk ranking of the rooms/plant fire areas, conditional core damage probabilities for those rooms and areas, and transient sequences for these rooms). This information can usually be found in the licensee's NFWA 805 Transition Report, submitted as part of the license amendment request. If additional information on fire risk insights or CCDPs' is needed, the team leader should contact the Fire Protection Branch in NRR. After considering the focus of past fire protection and post-fire safe shutdown inspections, the team leader should select the fire areas for inspection. Past inspection records should be used with due consideration of the possible changes that may have occurred in transitioning the plant fire protection program to NFWA 805 from the previous fire protection program regulatory basis.

After the information gathering site visit, the team leader should use the SRA developed fire risk insights, as well as technical input from the other team members, to develop an inspection plan addressing (for the fire areas selected) post-fire nuclear safety capability and the fire protection features for maintaining one success path free of fire damage.

3. Information Required/Preparation. During the preparation period, the inspection team should gather sufficient information to become familiar with the plant and the licensee's FPP. Such information includes:
  - (a) The reactor plant's design, layout, and equipment configuration.
  - (b) The reactor plant's current fire protection regulatory and licensing basis through review of 10 CFR 50.48(a) and (c), NFWA 805, Regulatory Guide 1.205, NRC SEs on fire protection, the plant's operating license, updated final safety analysis report, and approved exemptions or deviations, and if available, the licensee's transition report developed in accordance with NEI 04-02.
  - (c) For the fire areas selected for inspection, the licensee's strategy,



methodology, and procedures, for meeting the post-fire nuclear safety performance criteria. Among the sources of information are the updated final safety analysis report, the latest version of the fire hazards analysis, the latest version of the post-fire nuclear safety capability assessment, FPP changes that used the NFPA 805 plant change evaluation criteria, engineering equivalency evaluations (e.g., previous Generic Letter 86-10 evaluations), plant drawings, emergency/abnormal operating procedures, and the results of licensee internal audits (e.g., self assessments and quality assurance audits of the FPP).

- (d) The historical record of plant-specific fire protection issues found by reviewing plant-specific documents such as previous NRC inspection results, internal audits performed by the reactor licensee (e.g., self-assessments and quality assurance audits), corrective action system records, event notifications submitted in accordance with 10 CFR 50.72, "Immediate Notification requirements for Operating Nuclear Power Reactors," and licensee event reports (LERs) submitted in accordance with 10 CFR 50.73, "Licensee Event Report System." In reviewing past inspection records, the team should examine past issues in light of any changes made by the licensee in the transition to, and implementation of, an FPP meeting 10 CFR 50.48(c) and NFPA 805.
- (e) The nuclear safety capability systems and support systems credited by the licensee's analysis for each fire area, room, or zone to be inspected for meeting the nuclear safety performance criteria (e.g., reactivity control, reactor coolant inventory and pressure control, decay heat removal, vital auxiliaries, and process monitoring functions) as necessary to comply with the shutdown requirements of 10 CFR 50.48(a) and plant-specific licensing requirements. The team members must thoroughly understand the logic for meeting the nuclear safety performance criteria for each area, room, or zone to be inspected.
- (f) The licensee's analytical approach for electrical circuit separation analyses and the licensee's methodology for identification and resolution of circuits of concern. The team's electrical review should include addressing the assumptions and boundary conditions used in the performance of the licensee's analyses.
- (g) The Office of Nuclear Reactor Regulation (as documented in staff SE) and peer review results of licensee application of risk-informed, performance-based methods (i.e., fire modeling and probabilistic risk assessment) to determine the adequacy of fire protection systems, features, and nuclear safety capability.

- (h) Licensee use of recovery actions to meet performance criteria. Recovery actions are measures taken to achieve nuclear safety performance criteria that occur outside the control room or primary control stations.
- (i) The licensee's monitoring program established to meet NFPA 805 Section 2.6.
- (j) Any plant change evaluations the licensee has performed that affect the selected fire areas.

03.02 Fire Protection Inspection Activities. Fire areas that meet the deterministic criteria of NFPA 805 are deemed to satisfy the performance criteria without further analysis. Where recovery actions are relied on to achieve performance criteria, the use of a performance-based approach is required (see NFPA 805, Section 4.2.3.1).

The deterministic criteria of NFPA 805, Chapter 4, are identical (or very similar) to the deterministic requirements of FPPs meeting Appendix R to 10 CFR Part 50, or the branch technical position of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Section 9.5.1, with the exception of alternative shutdown. NFPA 805 does not contain deterministic criteria that correlate directly with alternative shutdown requirements (e.g., 10 CFR Part 50 Appendix R, III.G.3 and III.L). Where recovery actions are taken outside the main control room or primary control station(s) to demonstrate the availability of a success path to meet performance criteria, NFPA 805 requires use of a performance-based approach (see NFPA 805, Section 4.2.3.1).

Alternative shutdown fire areas should have been transitioned by the licensee to the NFPA 805 FPP using the performance-based approach. Any primary control stations utilized by the licensee should have been previously approved by the NRC in a safety evaluation. Staff SEs and licensee documentation should be reviewed to determine the extent to which these primary control station(s) have been previously approved by the staff. If not previously approved, performance based analyses should demonstrate that the performance-criteria are met. Recovery actions for alternative shutdown fire areas should be verified to be feasible based on the criteria established in the licensee's FPP as approved by the risk-informed, performance-based FPP safety evaluation.

One of the primary differences between a deterministic FPP based on Appendix R to 10 CFR Part 50, the Standard Review Plan (NUREG-0800), or a specific license condition, and a risk-informed, performance-based program is the application of engineering analysis to establish the adequacy and acceptability of fire protection systems, features, and nuclear safety capability. The application of performance-based engineering analyses (e.g., fire models and risk assessment) should be supported by licensee documentation demonstrating that the methods are acceptable to the authority having jurisdiction, validated and verified, performed by persons with appropriate experience, and applicable to the conditions. Licensees should have established programs or methods to monitor plant changes for impact to the analyses to provide assurance that

the assumptions and conclusions of the analyses remain valid.

According to the Statement of Considerations in the *Federal Register* (69 FR 33536, p. 33548), 10 CFR 50.48(c)(4) provides licensees with a mechanism to obtain NRC approval of alternatives to NFPA 805. The mechanism includes the use of performance-based approaches for the FPP elements and minimum design requirements in Chapter 3 of NFPA 805. The licensee's request should be in the form of a license amendment request and should demonstrate that the licensee's proposed alternative satisfies the performance goals, objectives, and criteria specified in NFPA 805 for nuclear safety and radiological releases. The proposed alternative must also maintain safety margins and fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire SSD capability). Addressing these criteria allows the NRC to determine that the alternative implements the performance goals, objectives, and criteria in Chapter 1 and complies with the requirements of General Design Criterion 3 in Appendix A to 10 CFR Part 50.

### 03.03 B.5.b Inspection Activities.

- a. NEI 06-12, "B.5.b Phase 2 & 3 Submittal Guideline," the licensee's submittals, the NRC's SE, and the conforming license conditions (codified as 10 CFR 50.54(hh)(2)), available on the [B.5.b Inspection Community of Practice](#) website provide the bases and acceptance guidelines for B.5.b related equipment and mitigating strategies. Previous inspection reports should be referenced for commitments made by licensees to correct deficiencies identified during prior performance of this inspection or performance of Temporary Instruction 2515/171.
- b. It is expected that most of the material that will be reviewed as part of this inspection effort will be sensitive unclassified non-safeguards information (SUNSI). However, based on the scope of the inspection, it is not expected that any SUNSI material will need to be documented in the inspection report, and inspectors should avoid withholding information from public inspection reports to the maximum extent practical. If an inspection does require documentation of SUNSI, guidance on how it should be accomplished is provided in Inspection Manual Chapter 0612, "Power Reactor Inspection Reports." Additional guidance regarding SUNSI is available on the NRC internal website (<http://www.internal.nrc.gov/sunsi>).

03.04 Identification and Resolution of Problems. Review a sample of corrective action documents detailing problems affecting fire protection or SSD capability. For licensees that received enforcement discretion for circuit protection issues, verify that applicable problems were identified and entered into the corrective action program and addressed as described in the applicable enforcement guidance memorandum.

## 71111.05-04 RESOURCE ESTIMATE

Issue Date: 10/28/11

Effective Date: 01/01/12

The resource to perform this inspection procedure is estimated to be 240 hours every 3 years regardless of the number of reactor units at the site.

#### 71111.05-05 PROCEDURE COMPLETION

Inspection of the minimum sample size will constitute completion of this procedure in the Reactor Programs System.

The minimum sample size for fire protection inspection activities is defined as 2 samples (inspection of two fire areas), regardless of the number of reactor units at that site.

The minimum sample size for B.5.b inspection activities is defined as 1 sample, regardless of the number of reactor units at that site.

#### 71111.05-06 REFERENCES

NOTE: Some references contain hyperlinks to the specific document. These hyperlinks should be used with caution (the linked document should be verified to be the current version prior to use).

National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition" (NFPA 805)

Inspection Manual Chapter 0609, Appendix F, "Fire Protection Significance Determination Process"

Inspection Procedure 71152, "Identification and Resolution of Problems"

[Information Notice 97-48](#), "Inadequate or Inappropriate Interim Fire Protection Compensatory Measures"

Individual Plant Examination of Externally Initiated Events (IPEEE)

Regulatory Guide 1.189, "Fire Protection for Nuclear Power Plants"

Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants"

NEI 04-02, Revision 2, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," February 2006

NEI 00-01, Revision 2, "Guidance for Post-Fire Safe Shutdown Analysis"

[Regulatory Issue Summary 2005-07](#), "Compensatory Measures to Satisfy the Fire Protection Program Requirements"

Temporary Instruction 2515/171, "Verification of Site Specific Implementation of B.5.b Phase 2 & 3 Mitigating Strategies"

NEI 99-04, "Guidelines for Managing NRC Commitments" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML003680088)

[NRR Office Instruction 105](#), "Managing Regulatory Commitments Made by Licensees to the NRC"

NEI 06-12, Revision 2, "B.5.b Phase 2 & 3 Submittal Guideline," December 2006 (ADAMS Accession No. ML070090060)

### [B.5.b Inspection Community of Practice](#)

WCAP 16800-NP, Revision 0, "Insights for Operating Steam Generators to Minimize RCS Inventory Loss Following a Loss of All AC and DC Power" (ADAMS Accession No. ML091410184)

## ATTACHMENT 1

[Mr. President]  
[Licensee Nuclear Department]  
[Licensee Corporation or Company]  
[Address]

SUBJECT: [SELECTED NUCLEAR POWER STATION], UNITS 1 AND 2 -  
NOTIFICATION OF CONDUCT OF A TRIENNIAL FIRE PROTECTION  
BASELINE INSPECTION

Dear Mr. [Name]:

The purpose of this letter is to notify you that the U.S. Nuclear Regulatory Commission (NRC) Region #[No.] staff will conduct a triennial fire protection baseline inspection at [Selected Nuclear Power Station, Units 1 and 2] in [Month, Year]. The inspection team will be lead by [First and Last Name], a fire protection specialist from the NRC Region #[No.] Office. Personnel from NRC Region #[No.], and [Contracted National Laboratory] will compose the team. The inspection will be conducted in accordance with Inspection Procedure 71111.05XT, the NRC's baseline fire protection inspection procedure.

The schedule for the inspection is as follows:

- Information gathering visit – [Dates] [Note - This date is pre-coordinated with the licensee]
- Week of onsite inspection – [Dates]

The purposes of the information gathering visit are to obtain information and documentation needed to support the inspection, and to become familiar with the [Selected Nuclear Power Station, Units 1 and 2] fire protection programs, fire protection features, post-fire safe shutdown capabilities and plant layout, mitigating strategies to address Section B.5.b of the Interim Compensatory Measures Order, EA-02-026, of February 25, 2002, and Title 10 of the *Code of Federal Regulations* (10 CFR) 50.54(hh)(2); and, as necessary, obtain plant specific site access training and badging for unescorted site access. Enclosures 1 and 2 list the types of documents that the team may be interested in reviewing and possibly obtaining.

During the information gathering visit, the team will also discuss the following inspection support administrative details: office space size and location; specific documents requested to be made available to the team in its office spaces; arrangements for reactor site access (including radiation protection training, security, safety, and fitness for duty requirements); and the availability of knowledgeable plant engineering and licensing organization personnel to serve as points of contact during the inspection.

Issue Date: 10/28/11  
Effective Date: 01/01/12

Att1-1

71111.05XT

We request that during the onsite inspection week you ensure that copies of analyses, evaluations or documentation regarding the implementation and maintenance of the [Selected Nuclear Generating Station, Units 1 and 2] fire protection program, including post-fire safe shutdown capability, be readily accessible to the team for its review. Of specific interest for the fire protection portion of the inspection are those documents that establish that your fire protection program satisfies NRC regulatory requirements and conforms to applicable NRC and industry fire protection guidance. For the B.5.b portion of the inspection, those documents implementing your mitigating strategies and demonstrating the management of your commitments for the strategies are of specific interest. Also, personnel should be available at the site during the inspection who are knowledgeable regarding those plant systems required to achieve and maintain safe shutdown conditions from inside and outside the control room (including the electrical aspects of the relevant post-fire safe shutdown analyses), reactor plant fire protection systems and features, and the [Selected Nuclear Power Station] fire protection program and its implementation.

This letter does not contain new or amended information collection requirements subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). Existing information collection requirements were approved by the Office of Management and Budget, under control number 3150-0011. The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid Office of Management and Budget control number.

Your cooperation and support during this inspection will be appreciated. If you have questions concerning this inspection, or the inspection team's information or logistical needs, please contact [First and Last Name], the team leader, in the Region #[No.] Office at [phone number].

Sincerely,

Docket Nos.: 50-[No.]  
and 50-[No.]

Enclosure: As stated (2)

## ENCLOSURE 1

### Reactor Fire Protection Program Supporting Documentation

(Note: This is a broad list of the documents the NRC inspection team may be interested in reviewing, and possibly obtaining, during the information gathering site visit.)

1. The current version of the fire protection program and fire hazards analysis.
2. Current versions of the fire protection program implementing procedures (e.g., administrative controls, surveillance testing, and fire brigade).
3. Fire brigade training program and pre-fire plans.
4. Post-fire nuclear safety capability systems and separation analysis.
5. Analysis supporting achieving and maintaining nuclear safety performance criteria, including those analyses for areas requiring recovery actions.
6. Piping and instrumentation (flow) diagrams showing the components used to achieve and maintain nuclear safety performance criteria for fires outside the control room and other areas requiring recovery actions at other than primary control stations.
7. Plant layout and equipment drawings that identify the physical plant locations of nuclear safety capability equipment.
8. Plant layout drawings that identify plant fire area delineation, areas protected by automatic fire suppression and detection, and the locations of fire protection equipment.
9. Plant layout drawings which identify the general location of the emergency lighting units required to support achieving and maintaining nuclear safety performance criteria.
10. Plant operating procedures for achieving nuclear safety performance criteria from inside the control room with a postulated fire occurring in any plant area outside the control room, procedures for achieving nuclear safety performance criteria in the event of a fire in either the control or cable spreading room, or any area requiring recovery actions to achieve control from other than the main control room or primary control stations.
11. Maintenance and surveillance testing procedures for nuclear safety capability systems and equipment, and fire barriers, detectors, pumps and suppression systems.



12. Maintenance procedures that routinely verify fuse breaker coordination in accordance with the nuclear safety circuit coordination analysis.
13. A sample of significant design change packages and engineering equivalency evaluations related to fire protection and post-fire nuclear safety capability (e.g., Generic Letter 86-10 evaluations).
14. The reactor plant's probabilistic risk assessment (PRA), results of any PRA reviews, and listings of actions taken or plant modifications conducted in response to PRA information (including NFPA 805, Section 2.4.3, Fire Risk Evaluations, and NFPA 805, Section 2.4.4, Plant Change Evaluations).
15. Temporary modification procedures.
16. Organization charts of site personnel, including fire protection staff personnel.
17. If applicable, layout or arrangement drawings of potential reactor coolant/recirculation pump lube oil system leakage points and associated lube oil collection systems.
18. A listing of the safety evaluations that form the licensing basis for the reactor plant's post-fire nuclear safety capability.
19. Procedures or instructions that control the configuration of the reactor plant's fire protection program, features, and post-fire nuclear safety capability methodology and system design.
20. A list of applicable codes and standards related to the design of plant fire protection features and evaluations of code deviations, including any safety evaluations issued for deviations from NFPA 805 fundamental fire protection program and design elements (NFPA 805, Chapter 3).
21. Procedures or instructions that govern the implementation of plant modifications, maintenance, and special operations, and their impact on fire protection.
22. The three most recent fire protection quality assurance (QA) audits and/or self-assessments.
23. Recent QA surveillances of fire protection activities.
24. A listing of open and closed fire protection condition reports (problem reports / nuclear condition reports (NCRs) / event analysis reports (EARs) / problem identification and resolution reports).

25. Listing of plant fire protection program and licensing basis documents.
26. A listing of the NFPA code versions committed to (NFPA codes of record).
27. A listing of plant deviations from code commitments.
28. Actual copies of engineering equivalency evaluations (e.g., Generic Letter 86-10 evaluations).

## ENCLOSURE 2

### Mitigating Strategies Supporting Documentation

(Note: This is a broad list of the documents the NRC inspection team may be interested in reviewing, and possibly obtaining, during the information gathering site visit.)

1. A list of all modifications to regulatory commitments made to meet the requirements of Section B.5.b of the Interim Compensatory Measure (ICM) Order, EA-02-026, dated February 25, 2002, the subsequently imposed license conditions, and Title 10 of the *Code of Federal Regulations* (10 CFR) 50.54(hh)(2).
2. Lists of procedures and guidelines that were revised or generated to implement the mitigation strategies. These could be extensive damage mitigation guidelines (EDMGs), severe accident management guidelines (SAMGs), emergency operating procedures (EOPs), abnormal operating procedures (AOPs), etc.
3. A matrix that shows the correlation between the mitigation strategies identified in Nuclear Energy Institute 06-12 and the site-specific procedures or guidelines that are used to implement each strategy.
4. Engineering evaluations and calculations that were used to verify engineering bases for the mitigation strategies.
5. Piping and instrumentation diagrams or simplified flow diagrams for systems relied on in the mitigation strategies. These could be of the type used for training.
6. A list of modification packages or simplified drawings/descriptions of modifications made to plant systems to implement the mitigation strategies.
7. Copies of procedures used to inventory equipment (hoses, fittings, pumps, etc.) required to implement the mitigation strategies.
8. A list of B.5.b strategies, if any, that have implementing details that differ from those documented in the submittals and the safety evaluation.
9. A copy of site general arrangement drawing(s) that show the majority of buildings/areas referenced in B.5.b documents.
10. Training records, training matrix, lesson plans related to B.5.b.
11. Copies of memoranda of understanding (e.g., with local fire departments) required to implement any mitigating strategies.

Attachment 2

Revision History for  
Inspection Procedure 71111.05XT

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
N/A	ML110550536 CN 11-006 04/19/11	Researched commitments for 4 years and found none.  New document to provide inspection guidance for plants transitioned to the NFPA 805 fire protection program.	Yes	05/31/2011	ML110550578
N/A	ML11201A171 10/28/11 CN 11-025	This revision modifies the resource estimate to reflect the 2011 ROP Realignment.	No	N/A	N/A