



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
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August 17, 1998

MEMORANDUM TO: Arthur T. Howell, Director  
Division of Reactor Safety, RIV

FROM: John N. Hannon, Director  
Project Directorate IV-1  
Division of Reactor Projects III/IV  
Office of Nuclear Reactor Regulation

SUBJECT: RESPONSE TO REGION IV TASK INTERFACE AGREEMENT (TIA)  
(96TIA008) - EVALUATION OF DEFINITION OF CONTINUOUS FIRE  
WATCH (TAC NO. M96550)

By memorandum dated September 9, 1996, NRC Region IV asked the Office of Nuclear Reactor Regulation (NRR) to review an issue concerning the fire watches at Waterford Steam Electric Station, Unit 3 (Waterford 3). Specifically, during November 13-17, 1995, and January 16-18, 1996, Region IV inspected Waterford 3 and found that Entergy Operations, Incorporated (the licensee), had revised its definition of a continuous FIRE WATCH. The licensee concluded that the change would not decrease the effectiveness of its fire protection program. Region IV questioned the adequacy of the licensee's interpretation and opened Inspection Followup Item 382/9520-01 in NRC Inspection Report 50-382/95-20. Region IV requested that NRR provide guidance regarding the acceptability of the licensee's definition and the adequacy of the licensee's conclusion that the change did not degrade the effectiveness of the Waterford 3 fire protection program. Region IV also requested guidance regarding the specific enforcement action that should be taken with respect to this inspection item. Region IV noted that the definition of continuous fire watch that is used at Waterford 3 has also been adopted by a number of licensees.

Our response to the region's questions regarding the licensee's definition of a continuous fire watch is attached. On the basis of our review, we concluded that the definition of a continuous fire watch used by the licensee for Waterford 3 is not consistent with the intent of the continuous fire watch (to remain in the affected fire area at all times), that the licensee did not provide a technical justification for redefining the criteria for a continuous fire watch or for extending the frequency of the fire watch patrols, and did not establish that the newly defined fire watch is equivalent to the previously defined fire watch. We also concluded that Procedure FP-001-014, Revision 9, Change 2, has a potential to create situations during which there could be inadequate fire watch coverage. To the extent that other licensees have adopted similar definitions for continuous fire watches without adequate technical justification, our conclusions would be the same.

With respect to potential enforcement action, the importance of the violation should, of course, be evaluated in accordance with the NRC Enforcement Policy. Consideration should be given to the actual and potential consequences as well as the programmatic implications of the inappropriate procedural changes in arriving at a final enforcement decision.

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In its memorandum of September 9, 1996, Region IV noted that there is an absence of technical guidance on compensatory measures. We agree and note that NRC inspectors frequently ask us questions about the appropriateness and acceptability of interim compensatory measures for fire protection deficiencies and nonconformances. Therefore, in the attached TIA response we provided information about compensatory measures that goes beyond that specifically requested by Region IV. This information is consistent with information that the staff has issued in other documents such as final directors decisions, information notices, and responses to other TIAs. In addition, independent of this TIA, we have decided that it would be beneficial to develop a comprehensive regulatory guide that consolidates and clarifies the existing staff positions, interpretations, and guidance related to reactor fire protection. We documented our plans for such a regulatory guide in SECY-98-058, "Development of a Risk-Informed, Performance-Based Regulation for Fire Protection at Nuclear Power Plants," March 26, 1998. With technical assistance from Pacific Northwest Laboratories, we are currently preparing the regulatory guide. We plan to provide guidance regarding the use of interim compensatory measures for fire protection deficiencies and nonconformances in the regulatory guide.

It should also be noted that subsequent to the Region IV request, on July 9, 1997, NRR issued Information Notice (IN) 97-48, "Inadequate or Inappropriate Interim Fire Protection Compensatory Measures," and on October 8, 1997, NRR issued Generic Letter (GL) 91-18, Revision 1, "Information to Licensees Regarding NRC Inspection Manual Section On Resolution of Degraded and Nonconforming Conditions." These NRC documents provide additional insights regarding compensatory measures. Specifically, IN 97-48 includes a detailed discussion about the acceptability of interim compensatory measures to address degraded and nonconforming fire protection and post-fire safe shutdown conditions, gives examples of acceptable compensatory measures, and discusses potential problems associated with the implementation of such measures. Revision 1 to GL 91-18 addresses licensee activities associated with resolving degraded and nonconforming conditions for plants that are at power and for plants that will resume operations from any shutdown. Attachment 1 to the GL, Inspection Manual, Part 9900 Technical Guidance, "Resolution of Degraded and Nonconforming Conditions," includes fire protection systems, structures, and components (SSCs) within the scope of the guidance for reviewing licensee actions involving degraded and nonconforming conditions.

Docket No. 50-382

Attachment: As stated

cc w/att: J. T. Wiggins, RI  
J. Jaudon, RII  
J. Grobe, RIII

ASSESSMENT BY OFFICE OF NUCLEAR REACTOR REGULATION  
REGION IV CONCERNS REGARDING THE  
DEFINITION OF A CONTINUOUS FIRE WATCH  
WATERFORD STEAM ELECTRIC STATION, UNIT 3  
DOCKET NO. 50-382

## 1.0 INTRODUCTION

During November 13-17, 1995, and January 16-18, 1996, NRC Region IV conducted an inspection at Waterford Steam Electric Station, Unit 3 (Waterford 3). The inspectors found that Entergy Operations, Incorporated (the licensee), had revised its Procedure FP-001-014, "Duties of a Fire Watch," Revision 9, Change 2, dated October 19, 1995, and changed the criteria for a continuous fire watch. Section 5.2.1 of the revised procedure specified the following criteria for a continuous fire watch:

- (1) Each location requiring a fire watch within a specified area will be patrolled once every 15 minutes with a margin of 5 minutes.
- (2) A specified area is one or more locations, which are easily accessible to each other, that can be patrolled in 15 minutes.
- (3) A specified area may consist of more than one fire area, so long as easy access can be demonstrated.
- (4) Easily accessible means there are no key-locked doors, step off pads, or hazards that would otherwise impede the continuous fire watch from patrolling the area within 15 minutes.

In contrast to Procedure FP-001-014, Revision 9, Change 2, which allows a continuous fire watch to patrol multiple fire areas, the previous version of the procedure had specified that a continuous fire watch was restricted to a single fire area.

During the inspection, the licensee informed the Region IV inspector that it had based its new criteria for a continuous fire watch on a letter of July 15, 1986, from the NRC to Indiana and Michigan Electric Company (IMEC), the licensee for Donald C. Cook Nuclear Power Plant, Units 1 and 2 (D.C. Cook). The licensee also informed the inspector that its revised procedure would not decrease the effectiveness of its fire protection program. The inspector questioned the adequacy of the licensee's interpretation and concluded that additional NRC review was required. This issue is tracked as Inspection Followup Item 382/9520-01 in NRC Inspection Report 50-382/95-20.

By memorandum dated September 9, 1996, Region IV asked the Office of Nuclear Reactor Regulation (NRR) to review the new criteria for a continuous fire watch that was adopted by Waterford 3. Region IV requested that NRR provide guidance regarding the acceptability of the new criteria and the adequacy of the licensee's conclusion that the procedure change did not degrade the effectiveness of its fire protection program. Region IV noted that the definition of continuous fire watch that is used at Waterford 3 has also been adopted by a number of licensees.

## 2.0 ASSESSMENT

### 2.1 Overview of Fire Protection Compensatory Measures

Each echelon of fire protection defense in depth (i.e., prevent fires, detect and suppress fires, design systems to limit fire damage), should meet certain minimum requirements; however, strengthening any one can compensate in some measure for weaknesses, known or unknown in the others. In some cases, reductions in defense in depth can be immediately corrected. For example, combustibles can be removed if found in a combustible free zone. In other cases, more time is needed to correct the problem (e.g., repair an inoperable fire detection system or install a missing fire barrier). In still other cases, fire protection features are purposefully removed from service (e.g., a fire barrier penetration seal may be removed to allow a new cable run). When immediate corrective actions cannot be taken, licensees implement compensatory measures to restore, in some measure, the reduction in defense in depth created by the degraded, inoperable, or nonconforming condition until permanent corrective actions can be implemented. The use of compensatory measures, on a short term basis, by licensees in such instances is an integral part of NRC-approved fire protection programs, which are controlled by Section 50.48, "Fire protection," of Title 10 of the Code of Federal Regulations (10 CFR 50.48), plant technical specifications (TS), and fire protection license conditions (see Sections 2.2 and 2.3, below). In most cases, such measures can effectively compensate for the reduction in fire protection defense-in-depth that is introduced by the degraded, inoperable, or nonconforming condition until the operability of the degraded or inoperable fire protection feature can be restored or the nonconformance can be corrected.

Compensatory measures are usually established on a fire area basis. A "fire area" is a plant area that is sufficiently bounded to withstand the fire hazards associated with the area and, as necessary, to protect important equipment within the area from a fire outside the area. Redundant post-fire safe shutdown systems located within a fire area are protected to provide reasonable assurance that one train of systems will be free of fire damage and available to achieve and maintain safe shutdown conditions. Licensees establish the post-fire safe shutdown systems and the plant fire areas on the basis of their plant fire hazards and safe shutdown analyses.

For typical fire protection system deficiencies (e.g., inoperable fire detection and suppression systems) the plant administrative procedures or technical requirements specify the appropriate compensatory measures. Fire watches are the most common form of compensatory measure for typical fire protection system deficiencies. The appropriate compensatory measures for unique conditions (e.g., such nonconformances as the unexpected discovery that redundant post-fire safe shutdown systems are not protected in accordance with the regulatory requirements or licensing commitments) need to be evaluated on a case by case basis and tailored to the particular circumstances. (As discussed in Section 2.4, below, Generic Letter (GL) 91-18, Revision 1, "Information to Licensees Regarding NRC Inspection Manual Section On Resolution of Degraded and Nonconforming Conditions," provides guidance for reviewing licensee actions involving degraded and nonconforming conditions.) For unique situations, in addition to a fire watch, enhanced compensatory measures may be warranted to

fully address potential safety issues presented by the nonconformance. Examples include enhancing controls over combustible materials and hot work, briefing operators and fire brigade members on the nonconforming condition, implementing temporary operating procedures, prestaging manual fire fighting equipment, and installing temporary fire protection features.

Fire watches are personnel trained by the licensees to inspect for the control of ignition sources, fire hazards, and combustible materials; to look for signs of incipient fires; to provide prompt notification of fire hazards and fires; and, in some cases, to take actions to begin fire suppression activities. The primary purpose of the fire watch is to look for fire hazards and other conditions that could lead to a fire. Therefore, the fire watch strengthens the first echelon of fire protection defense in depth (fire prevention) by compensating for the weakness introduced by the inoperable, degraded, or nonconforming condition. Fire watches may also detect fires, call out the fire brigade, give exact information regarding the nature and location of the fire to the fire brigade, and initiate fire suppression activities for incipient stage fires. These actions all strengthen the second echelon of fire protection defense in depth (fire detection and suppression). (Whether or not a fire watch engages in incipient stage fire fighting activities is based on the individual licensees' training and procedures.)

There are two types of fire watches. They are the continuous fire watch and the hourly fire watch patrol (or roving fire watch). The type of fire watch needed (continuous or hourly) is usually a function of the level of automatic fire detection capability installed in the fire area with an inoperable, degraded, or nonconforming condition. In most cases, when a fire area is equipped with an operable fixed, automatic fire detection system, an hourly fire watch patrol is acceptable. In some cases, an hourly fire watch can effectively patrol multiple fire areas within the one hour period available to complete a fire watch tour. Whether or not a single fire watch patrol can effectively cover multiple fire areas depends on the size and complexity of the fire areas and the accessibility of the fire areas.

Continuous fire watches are used when an automatic fire detection is not installed in the fire area or the automatic fire detection system is inoperable. (In some cases a continuous fire watch may be warranted to compensate for significant fire protection deficiencies even if a fire detection system is installed in the area. An example would be an unprotected safe shutdown train.) A continuous fire watch is an uninterrupted fire watch posted in a single fire area. Where an automatic fire detection system is not installed, the continuous presence of a fire watch is needed to adequately compensate for the degraded, inoperable, or nonconforming condition. In some cases, it may be necessary to strategically post a number of fire watches in order to achieve the required level of fire safety and effectively maintain confidence that potential fire conditions will be promptly detected and reported.

The overall effect of the enhancements provided by the continuous or regular presence of fire watches in the affected areas adequately compensates for the weaknesses in the fire protection program created by inoperable, degraded, or nonconforming conditions. That is, the physical presence of a fire watch as a compensatory measure in the affected fire area provides reasonable assurance that a fire would be prevented through prompt recognition and disposition of fire hazards and that a fire that occurs despite these efforts would be promptly

detected, reported, and extinguished during its incipient stage by either the fire watch, if trained, or by the plant fire brigade. The use of a fifteen minute roving fire watch in an area that requires a continuous fire watch, however, does not provide reasonable assurance that an incipient-stage fire would be detected before it becomes sufficiently developed to adversely affect plant operations.

## 2.2 Overview of Regulatory Requirements and Guidance

The basic fire protection regulation for commercial nuclear power plants is 10 CFR 50.48. Section 50.48 references General Design Criterion (GDC) 3 of Appendix A to 10 CFR Part 50, "Fire protection," Appendix R to 10 CFR Part 50 "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," and various NRC fire protection guidance documents.

Section 50.48(a) states that each operating nuclear power plant must have a fire protection plan that satisfies GDC 3 and Section 50.48(a) notes that fire protection guidance for nuclear power plants is contained in two NRC documents. These are (1) Branch Technical Position (BTP) Auxiliary Power Conversion Systems Branch (APCSB) 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," for new plants docketed after July 1, 1976, and (2) Appendix A to BTP APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976." These two NRC documents specify preferred methods for fire protection program design. In addition, Section 50.48(b) states that Appendix R establishes fire protection features required to satisfy GDC 3 with respect to certain generic issues for nuclear power plants licensed to operate prior to January 1, 1979. The provisions of Appendix R can be divided into two categories. The first category consists of those provisions that were backfit in their entirety to plants licensed to operate prior to January 1, 1979, regardless of whether or not alternatives to the specific requirements of these sections had been previously approved by the staff. These requirements are set forth in Section III.G, "Fire protection of safe shutdown capability," Section III.J, "Emergency lighting," and Section III.O, "Oil collection systems for reactor coolant pumps." The second category consists of requirements backfit on a plant-specific basis to the extent needed to resolve the "open" items of previous NRC staff fire protection reviews. An open item was defined as a fire protection feature that had not been previously approved by the NRC staff as satisfying the guidelines of Appendix A to BTP APCSB 9.5-1, as reflected in a staff fire protection safety evaluation report. (When it published Appendix R in the Federal Register, the staff sent letters to the licensees with plants operating prior to January 1, 1979. In those letters, the staff summarized the fire protection open items and told the licensees which Appendix R requirements must be satisfied in order to resolve these open items.)

Fire protection programs that meet the criteria of either BTP APCSB 9.5-1 or Appendix A to BTP APCSB 9.5-1 and the applicable sections of Appendix R satisfy 10 CFR 50.48 and GDC 3. NUREG-0800, "Standard Review Plan," (SRP) Section 9.5-1, "Fire Protection Program," incorporates the guidance of BTP APCSB 9.5-1 and Appendix A to BTP APCSB 9.5-1 and the criteria of Appendix R. Therefore, fire protection programs that meet the guidelines of SRP

Section 9.5-1 also satisfy 10 CFR 50.48 and GDC 3. This is documented in plant-specific safety evaluation reports. However, it is not specified in 10 CFR 50.48.

As stated in 10 CFR 50.48(a), the purpose of the fire protection plan is "to limit fire damage to structures, systems, or components important to safety so that the capability to safely shut down the plant is ensured." In general, a fire protection plan consists of administrative procedures and technical requirements, personnel for implementing the plan and for fire prevention and manual fire suppression activities, fire detection systems, automatic and manually operated fire suppression systems and equipment, and fire barriers. Compensatory measures are addressed in the plant administrative procedures and technical requirements and the plant TSs (see Section 2.3 below). However, with the exception of Appendix A to BTP

APCSB 9.5-1, which specifies that licensees should establish administrative controls for normal and abnormal conditions or such other anticipated operations as modifications and refueling activities, they are not expressly discussed or specified in the aforementioned NRC fire protection regulations and guidance documents.

### 2.3 Overview of TSs

Plant TSs require the licensees to establish, implement, and maintain written procedures that implement the NRC-approved fire protection program. The TSs also specified interim compensatory measures to address degradation and inoperability of the fire protection features that were included in the TSs (e.g., fire detection and suppression systems, fire barriers, and fire protection water supply).

In GL 86-10, "Implementation of Fire Protection Requirements," April 24, 1986, and GL 88-12, "Removal of Fire Protection Requirements from TSs," August 2, 1988, the staff requested that the licensees incorporate the NRC-approved fire protection program into the Final Safety Analysis Report (FSAR); incorporate the TS limiting conditions for operation, surveillance and test requirements, and remedial actions (compensatory actions) for fire protection systems into the fire protection program; and adopt a standard fire protection license condition; and delete the fire protection TSs that would then be unnecessary. In this manner, the fire protection program, including the systems, certain administrative and technical controls, the organization, and other plant features associated with fire protection, would have a status consistent with that of other plant features described in the FSAR. In addition, the standard license condition, requiring compliance with all provisions of the NRC-approved fire protection program as described in the FSAR, would be used to ensure uniform enforcement of the fire protection requirements.

Most plants have removed fire protection from the TSs in accordance with GL 86-10 and GL 88-12. For these plants, the compensatory measures are specified in the licensees' administrative procedures and technical requirements and are controlled by the NRC-approved fire protection program and the plant fire protection license condition.

The applicable TSs, administrative procedures, and technical requirements for Waterford 3 are described in Inspection Report 50-382/95-20.

#### 2.4 Generic Letter 91-18, Revision 1

GL 91-18, Revision 1, "Information to Licensees Regarding NRC Inspection Manual Section On Resolution of Degraded and Nonconforming Conditions," addresses licensee activities associated with resolving degraded and nonconforming conditions for plants that are at power and for plants that will resume operations from any shutdown. Attachment 1 to the GL, Inspection Manual, Part 9900 Technical Guidance, "Resolution of Degraded and Nonconforming Conditions," includes fire protection systems, structures, and components (SSCs) within the scope of the guidance for reviewing licensee actions involving degraded and nonconforming conditions. Section 4.6 of Attachment 1 to GL 91-18, Revision 1, identifies compensatory measures as an item to be considered in licensee assessments of reasonable assurance of safety for SSCs that are not expressly subject to TSs, and Section 4.7 of Attachment 1 to GL 91-18, Revision 1 provides guidance for evaluating compensatory measures as an interim step until final corrective actions are completed.

#### 2.5 Letter to IMEC From NRC of July 15, 1986

The staff reviewed the letter of July 15, 1986, from the NRC to IMEC, which Entergy Operations, Incorporated, cited as the basis for its revision to Procedure FP-001-014.

In a letter of May 22, 1986, IMEC requested that the staff approve a revision to the definition of a continuous fire watch in the bases section of the D.C. Cook TSs. Specifically, IMEC proposed to define a continuous fire watch as follows: "A continuous fire watch requires that a trained individual be in the specified area at all times and that each fire zone within the specified area be patrolled at least once every fifteen minutes with a margin of five minutes." Prior to the proposed change, IMEC had defined a continuous fire watch as a stationary watch who could not leave the immediate area. This required that IMEC post several fire watches within a single fire area if any of the fire zones within the area were out of visual range of a single fire watch.

By letter dated July 15, 1986, the staff approved the changes to the bases sections of the D.C. Cook TSs that IMEC requested in its letter of May 22, 1986. In its letter, the staff stated:

The continuous fire watches at the D.C. Cook Nuclear Plant have been assigned as one person to each of a number of fire zones within an area. For a number of areas these fire zones are readily accessible and easily viewed by a single fire watch on a frequency of about every fifteen minutes. This method of applying the fire watches will reduce the number of persons within the areas at a given time. Because some zones have high radiation and the person is not required to be in the zone at all times, the exposures to fire watches may also be reduced. The fifteen minutes patrol with a margin of fire minutes is acceptable.

This staff action approved the use a single fire watch to patrol multiple fire zones within a specific fire area. In this situation, the fire area would be continuously staffed. Conversely, at



Waterford 3, as described in Revision 9, Change 2, to Procedure FP-001-014, fire areas that require a continuous fire watch would not be continuously staffed since the procedure does not require that the fire watch remain within the specified fire area at all times but allows a single fire watch to patrol multiple fire areas. Therefore, the definition of a continuous fire watch used at Waterford 3 is not consistent with the definition of a continuous fire watch that the staff had approved for D.C. Cook.

### 3.0 CONCLUSION

On the basis of its review, the staff concluded that the definition of a continuous fire watch used by the licensee for Waterford 3 is not consistent with the intent of the continuous fire watch (to remain in the affected fire area at all times), nor is it consistent with the definition of a continuous fire watch that the staff had approved for D.C. Cook. The staff also concluded that the licensee did not provide technical justification for redefining the criteria for a continuous fire watch or for extending the frequency of the fire watch patrols, and did not establish that the newly defined fire watch is equivalent to the previously defined fire watch. Finally, the staff concluded that Procedure FP-001-014, Revision 9, Change 2, has the potential to create situations during which there could be inadequate fire watch coverage. To the extent that other licensees have adopted similar definitions for continuous fire watches without adequate technical justification, our conclusions would be the same.

Principal Contributor: S. West