



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

November 29, 1999

MEMORANDUM TO: Loren R. Plisco, Director
Division of Reactor Projects
Region II

FROM: Suzanne C. Black, Deputy Director
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: NRR RESPONSE TO TASK INTERFACE AGREEMENT 99-01,
ST. LUCIE PLANT, UNITS 1 AND 2 - RESOLUTION OF ST. LUCIE FIRE
PROTECTION FUNCTIONAL INSPECTION ITEMS
(TAC NOS. MA4655 AND MA4656)

By memorandum dated January 26, 1999, Region II transmitted a task interface agreement (TIA) concerning two unresolved items (URI) regarding fire barrier qualification and the design of a Halon 1301 fire suppression system. The subject TIA 99-01 describes the results of a Fire Protection Functional Inspection (FPFI) conducted in March and April 1998. Attached to the TIA were FPL handouts from a meeting with the Region, dated August 4, 1998, and excerpts from the FPFI report. The inspection findings led to identification of two specific concerns with respect to the fire protection program at St. Lucie:

1. URI 50-335, 389/98-201-08: Fire Barriers Not Qualified to Meet Plant Licensing Requirements. Specifically, the Thermo-Lag in the stairwell enclosures and the cable loft area is not qualified.
2. URI 50-335, 389/98-201-09: Fire Mitigation System Does Not Meet Plant Licensing Basis Requirements/Commitments or Minimum Industry Codes and Standards for System Design and Testing. This applies specifically to the design of the Halon 1301 system used as a fire suppressant in the cable spreading room.

We have reviewed the documents supplied with TIA 99-01, as well as various other applicable documents relating to St. Lucie's licensing basis, and have completed the review requested by the TIA. The TIA questions concerning the adequacy of the Thermo-Lag 330 fire barriers have been addressed by the licensee through its commitment to replace the cable spread room barrier wall with a rated 3-hour masonry wall, and to install full area sprinkler protection in the "A" train cable loft. The attachment documents the results of the review of the adequacy of the Halon 1301 fire suppression system in the cable spread room at St. Lucie, Unit 1, by the Office of Nuclear Reactor Regulation (NRR).

We understand that certain fire protection issues at St. Lucie, as well as at other plant sites, are the subject of ongoing regulatory discussions and inspections and may require additional input from NRR. However, we consider that this memorandum and its attachment completes

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our review and evaluation efforts associated with TAC Numbers MA4655 and MA4656. Please contact Bill Gleaves, the St. Lucie Project Manager, at 301-415-1479, if you have any questions on the attached evaluation.

Docket Nos. 50-335 and 50-389

Attachment: As stated

cc w/attachment: A. R. Blough, Region I
G. E. Grant, Region III
K. E. Brockman, Region IV

RESPONSE TO TASK INTERFACE AGREEMENT 99-01

REVIEW OF HALON 1301 FIRE SUPPRESSION SYSTEM

ST. LUCIE PLANT, UNIT 1

1. INTRODUCTION

During the Fire Protection Functional Inspection (FPFI) at St. Lucie Nuclear Power Plant, Unit 1, conducted during March 1998, the inspection team found that neither the cable spread room (CSR) Halon 1301 fire suppression system design, nor acceptance tests of the system performed by the licensee, demonstrated that the system would be adequate to suppress a deep-seated cable fire. By not being able to suppress a deep-seated cable fire, the system would be unable to perform as required by 10 CFR Part 50, Appendix R. The St. Lucie FPFI report, dated July 9, 1999, has a detailed technical discussion of the CSR and Halon 1301 system, which will not be repeated in this review. This TIA response will focus on the licensing basis for the system.

2. LICENSING BASIS

It is stated in 10 CFR 50.48(b) that plants licensed to operate prior to January 1, 1979, are required to implement Appendix R to 10 CFR Part 50. This section specifies that plants that had received an NRC acceptance of fire protection features satisfying the provisions of Appendix A to Branch Technical Position (BTP) APCS 9.5-1 were required to only implement the additional requirements of Appendix R, Sections III.G, III.J, and III.O. St. Lucie, Unit 1, did not receive an acceptance of the Halon 1301 system using the BTP APCS 9.5-1 guidelines.

Section III.G.1, Appendix R, requires that one train of systems needed to achieve and maintain hot shutdown conditions will remain free of fire damage. Section III.G.2 specifies fire protection methods to demonstrate that one train will remain free of fire damage. Section III.G.3 requires, in areas where it is not possible to meet one of the III.G.2 methods of ensuring that one train of equipment will remain free of fire damage, that alternative or dedicated shutdown capability be provided. Section III.G.3 also requires that a fire suppression system be provided for the area. Implicit in this requirement is the understanding that the system will be adequate to perform fire suppression functions for the fire hazards in the area.

The St. Lucie, Unit 1, Operating License Condition C.3 requires that the licensee implement and maintain in effect all provisions of the approved fire protection program, as described in the Updated Final Safety Analysis Report (UFSAR). The license condition also lists the licensee submittals provided as a part of the approved program. Licensee letter L-83-514, dated October 7, 1983, is listed as part of the approved program. In this letter the licensee stated that the separation requirements defined in Appendix R, Section III.G.2, could not be provided for essential components and circuits in the CSR and that alternative shutdown is provided. On February 4, 1980, the Plant System Branch of NRR issued a review of fire protection open items at St. Lucie, Unit 1, and concluded that a Halon 1301 or a carbon dioxide gaseous system was

ATTACHMENT

needed. During this review, the staff noted that a fixed fire suppression system is needed in this area to satisfy the requirements of Appendix R, Section III.G.3.

3. DISCUSSION

In Appendix 9.5A of the UFSAR, in a comparison of plant conformance to Appendix A to BTP 9.5-1 Guidelines, Paragraph E.4, it states, "The Halon 1301 automatic fire suppression system in the RAB [reactor auxiliary building] Cable Spread Room...is installed utilizing the guidelines of NFPA [National Fire Protection Association, Standard] 12A." The NFPA Standard 12A, "Halon 1301 Fire Extinguishing Systems," 1980 revision, the code of record (COR) for the system, states that "Deep-seated fires usually require much higher concentrations than 10 percent and much longer soaking times than 10 minutes." This section of the COR also states that the deep-seated potential of a solid material in a given situation can be established only by experiment. The NFPA provides guidance on how system performance should be determined. The hazard should be analyzed and verified by experiment, on a case-by-case basis. The primary fire load in the CSR is the large mass of electrical cables. The cable insulation will develop deep-seated fires when ignited and allowed to burn.

By memorandum from the Plant Systems Branch, NRR, to the Operating Reactors Branch #4, NRR, dated February 4, 1980, NRR evaluated certain open fire protection items and requested additional information on certain items that were discussed in the original August 17, 1979 SER. The memo stated, for Enclosure 3, "Evaluation of Incomplete Items," the NRC has re-evaluated items that were found acceptable in the original SER. The re-evaluation of these items (such as the use of a fire suppression system in the CSR) resulted from the review of the licensee's Fire Protection Evaluation report. Regarding the CSR, Enclosure 3 stated:

If Halon 1301 is used, the system should be designed to the applicable requirements of NFPA 12A with provisions for two discharges. Initial discharge shall produce a 7% Halon concentration with a soak time of 20 minutes. The reserve supply shall be capable of a 6% Halon concentration for 10 minutes.

As stated in the FPGI inspection report, "In 1986, the NRC commissioned Sandia National Laboratories to perform research on the question of effectiveness of fire suppressants on electrical cable fires. The results of this work were published in NUREG/CR-3656, 'Evaluation of Suppression Methods for Electrical Cable Fires'." The FPGI report notes that Table 6 of the NUREG states that for exposure fires, the minimum soak time required for a 6 percent concentration of Halon 1301 is 10 minutes for IEEE-383 qualified cables and 16 minutes for unqualified cables in the horizontal position. The FPGI report also notes that Table 10 of the NUREG report states that for fully developed fires, the minimum soak time required for a 6 percent concentration of Halon 1301 is 15 minutes for IEEE-383 qualified cables and 10 minutes for unqualified cables in the horizontal position. Thus, concerning Halon 1301, the NRC validated the appropriate soak times and concentrations to suppress a cable fire and this is consistent with the 1980 NRC memorandum. Although we can find no reference that the 1980 memorandum was forwarded to FPL, this validation supports our position that the St. Lucie, Unit 1, Halon 1301 concentration and soak time does not provide reasonable assurance that it would suppress a deep-seated cable fire.

As documented in the FPF report, the licensee designed the Halon system in the cable spread room to maintain a 6 percent concentration for a period of 4 to 5 minutes and greater than 5 percent for greater than 10 minutes.

The St. Lucie Halon 1301 system is actuated by a cross-zoned thermal detection system. The use of cross-zoned thermal detectors requires two independent detectors, spaced some distance apart, to reach their preset actuation temperature to initiate the discharge cycle for the Halon 1301 system. The Halon discharge is then further delayed by the fire door and HVAC damper interlocks. The slow response time of this suppression system design would allow time for the fire to continue to grow and become deep-seated, thus, requiring longer soak times to be effective. This detection system is in conformance with the discussion provided in the February 4, 1980 memorandum.

The licensee did not appear to consider the potential effect of a deep-seated fire in the design of the Halon 1301 system for the CSR as described in Appendix 2 of NFPA 12A, or to incorporate the guidelines concerning designing a Halon 1301 system for a deep-seated fire as specified in the COR. The system does not provide the required Halon 1301 concentrations or soak times discussed previously. The licensee provided no fire testing documentation to demonstrate that a lesser concentration or soak time would be adequate and effective for the hazard as specified in NFPA 12A for a deep-seated fire.

4. CONCLUSION

The licensee has not demonstrated that the Halon 1301 system installed in the St. Lucie, Unit 1, CSR is adequate to suppress the expected fire in the CSR, i.e., a deep-seated cable fire. Specifically:

- The system does not meet the guidance specified in the 1980 memorandum.
- The system does not meet the guidelines of NFPA 12A for a deep-seated fire, as required by the operating license.
- The licensee did not provide fire testing documentation or other analysis, to demonstrate that the system would be adequate or effective for suppressing a deep-seated cable fire.
- The system design, using cross-zoned thermal spot detectors for system actuation in conjunction with the required door and damper interlocks, could allow time for a fire to become deep seated and, therefore, its design parameters (hold time and concentration) does not provide a reasonable assurance that the Halon 1301 system would suppress a deep-seated cable fire.

Therefore, on the basis of its review, as documented above, the staff concludes that the Halon 1301 system installed in the St. Lucie, Unit 1, CSR does not meet the requirements of 10 CFR Part 50, Appendix R, Section III.G.3, which requires that a fire suppression system be installed in a fire area requiring alternative shutdown.

As part of our overall assessment of the St. Lucie Halon system, we also considered the backfit implications of the issues raised in the TIA and our response. It is our view, as detailed in this attachment, that the licensee has not demonstrated that the Halon system meets the design criteria specified in the applicable NFPA standard and, therefore, does not comply with the applicable regulatory requirements. The early correspondence, dated February 4, 1980, provided the original NRC staff position, and that position has not changed in any way. Therefore, we have concluded that the concerns about the adequacy of the Halon system represent a violation of the St. Lucie design basis and Appendix R and that the currently installed Halon system must meet the licensee's commitments and regulatory requirements, which does not constitute a backfit.

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Original signed by S.Black

cc w/attachment: A. R. Blough, Region I
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