GI-147, 1555 5p

Reference 1555

March 9, 1994

MEMORANDUM FOR: Eric S. Beckjord, Director
Office of Nuclear Regulatory Research

FROM: Joseph Murphy, Acting Director
Division of Safety Issue Resolution
Office of Nuclear Regulatory Research

SUBJECT: STAFF REVIEW GUIDANCE FOR GENERIC SAFETY ISSUE (GSI) 147, "FIRE-INDUCED ALTERNATE SHUTDOWN/CONTROL ROOM PANEL INTERACTIONS"

The prioritization of Generic Safety Issue 147 resulted in its classification as a "Licensing Issue." However, the safety significance was deemed likely to vary greatly from plant to plant and it appears unlikely that any cost-effective generic resolution could be identified. Thus, the staff recommended that plant-specific reviews be performed to evaluate the significance of this issue. Such reviews are currently required as part of the IPEEE program and a brief procedural guidance is provided in NUREG-1407, which was issued in June 1991. The resolution of GI-147 is to develop a staff review guidance of IPEEE submittals related to fire-induced alternate shutdown/control room panel interactions.

Enclosed for your information is the review guidance developed for GSI-147. This review guidance will be incorporated into the overall review guidance document for the IPEEE.

/s/

Joseph Murphy, Acting Director
Division of Safety Issue Resolution
Office of Nuclear Regulatory Research

Enclosure: As stated

*See Previous Concurrence

OFFICE:	SAIB/DSIR:	SAIB/DSIR:	SAIB/DSIR:	DD/DSIR:
NAME:	*JChen/bgj:	*MDrouin	: CAder	: JMurphy:
DATE:	10/14/93:	11/22/93 3/2/93	: 3/8 /93	: 3/9 /93:

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MDrouin
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JMurphy

REVIEW GUIDANCE FOR GI-147, "FIRE-INDUCED ALTERNATE SHUTDOWN/CONTROL ROOM PANEL INTERACTIONS"

1. INTRODUCTION

The Fire Risk Scoping Study (NUREG/CR-5088, Ref. 1) was initiated in 1987 in order to (1) identify fire risk issues that were not previously addressed in the fire probabilistic risk assessment (PRA) context, (2) provide initial assessment of the potential impact of these identified unaddressed issues, and (3) identify areas in need of further investigation. These issues represented aspects of the fire hazard which were perceived to be potentially significant contributors to fire-induced core damage frequency estimates, and had been identified after the performance of existing plant fire risk assessments. Fire-induced alternate shutdown/control room panel interactions (from here on referred to as the "Control Systems Interactions") was identified as one of those potential fire risk issues. This concern was subsequently established by RES as Generic Issue (GI) 147.

The prioritization of GI-147 in 1992 resulted in its classification as a "Licensing Issue" (Ref. 2). The safety significance of this issue was deemed likely to vary greatly from plant to plant and it appears unlikely that any cost-effective generic resolution could be identified. Thus, plant-specific reviews would be required to evaluate the significance of this issue. Such reviews are currently required as part of the IPEEE program (Ref. 3) and the procedural guidance is provided in NUREG-1407 (Ref. 4). This review guidance was developed for the review of licensees' IPEEE submittals related to control systems interactions, thus satisfies the resolution of GI-147.

2. POTENTIAL SAFETY SIGNIFICANCE

Under the scenario of fire occurring in a plant, e.g. in the control room, conditions could develop that may create a number of potential control systems vulnerabilities. The Fire Risk Scoping Study looked into current fire protection practices for control rooms, remote shutdown areas, control transfer areas and local control areas. The results indicated that a number of potential control fire scenarios, when combined with random failures of unaffected safety systems could result in core-melt sequences with core damage frequencies in the range of 1.0E-5/RY to 1.0E-6/RY.

3. Staff Review Guidance

The staff review should be centered on licensee's process for searching and quantifying the potential vulnerabilities associated with control systems interactions. Given a fire anywhere in the plant, the likely sources of control systems interactions could happen between the control room, remote shutdown panel, and shutdown systems. When combined with random failures of unaffected safety systems, this could result in core-melt sequences. Such interactions will not be identified by analyses such as those employed

for Appendix R to 10 CFR Part 50 (Ref. 5) reviews. Following are specific areas that should be reviewed:

1. Electrical independence of the remote shutdown control systems

   The primary concern of control systems interactions occurs at plants that do not provide independent remote shutdown control systems. The licensees' processes to (1) verify electrical independence and (2) evaluate the level of indication and control of remote shutdown control and monitoring circuits should be assessed.

   For plants that do not have remote control and monitoring circuits independent of the control room, the licensees' processes to verify that safe shutdown circuits are located physically independent of, or can be isolated from the control room for an exposure fire that causes a loss of control from the control room should be assessed.

2. Loss of control equipment or power before transfer

   The licensee's process for evaluating the loss of control power for certain control circuits as a result of hot shorts/blown fuses before transferring control to remote shutdown locations should be assessed.

   The licensee's process for evaluating the potential of damage to transfer switches which may lead to loss of control associated equipment from both the main control room and remote shutdown panels should also be assessed.

3. Spurious actuation of components leading to component damage, LOCA, or interfacing LOCA

   The licensee's process for evaluating the spurious actuation of one or more safety-related or safe-shutdown-related components as a result of fire induced cable faults, hot shorts, or components failures leading to component damage, LOCA, or interfacing LOCAs prior to taking control from remote shutdown panel should be assessed. This should also include assessment of the spurious starting and running of pumps as well as the spurious repositioning of valves.

4. Total loss of system function

   The licensee's process for evaluating total loss of system function as the results of fire-induced redundant component failure or electrical distribution system (power source) failure should be assessed.

REFERENCES

1. NUREG/CR-5088, "Fire Risk Scoping Study: Investigation of Nuclear Power Plant Fire Risk, Including Previously Unaddressed Issues," U.S. NRC, January 1989.

2. Memorandum from E. Beckjord to W. Minners, entitled "Generic Issue No. 147, Fire-Induced Alternate Shutdown/Control Room Panel Interactions," August 26, 1992.

3. Generic Letter No. 88-20, Supplement 4, "Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities - 10 CFR 50.54(f)," U.S. NRC, June 28, 1991.

4. NUREG-1407, "Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities," U.S. NRC, June 1991.

5. Appendix R to 10 CFR Part 50, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979."