TECHNICAL EVALUATION OF THE ELECTRICAL, INSTRUMENTATION, AND CONTROL DESIGN ASPECTS OF THE ESF RESET CONTROLS FOR THE PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2

(Docket Nos. 50-282 and 50-306)

by

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ROUGH DRAFT

ABSTRACT

This report documents the technical evaluation of the electrical, instrumentation, and control design aspects of the engineered safety feature reset controls for the Prairie Island Nuclear Power Plant. The review criteria are based on U.S. Nuclear Regulatory Commission requirements for safety-related equipment.

FOREWORD

This report is supplied as part of the Selected Electrical, Instrumentation, and Control Systems Issues (SEICI) Program being conducted for the U.S. Nuclear Regulatory Commission, Office of Inspection and Enforcement, Division of Operating Reactors, by Lawrence Livermore National Laboratory, Engineering Research Division of the Electronics Engineering Department.

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1. BACKGROUND

A potential problem regarding the resetting of engineered safety feature actuation signals (ESFAS) has been discovered at several operating nuclear power plants. Specifically, it was found that upon reset of an ESF signal certain safety-related equipment moves out of the emergency mode and returns to the non-safety mode, which is in violation of the requirements of IEEE Std-279-1971, Section 4.16.

During a review of system operation at North Anna Nuclear Power Plant, Unit 1, which occurred following a unit trip and subsequent safety injection on November 6, 1979, it was discovered that certain equipment important to safety, such as the control room habitability system dampers, returned to non-safety mode after the ESF signal was reset. Further investigation by both Virginia Electric and Power Company (VEPCO), the licensee for North Anna, and Stone and Webster Engineering Corporation, the plant's architect-engineer, revealed that other safety-related equipment also returned to non-safety mode after the ESF signal was reset. This return to non-safety mode caused the safety-related equipment to operate less conservatively than assumed in the safety analysis.

This deficiency may be common to Stone and Webster implementations of Westinghouse designs, as the same potential problem was found at both Beaver Valley and Surry nuclear plants and it is also related to problems at Millstone, Unit 3, and Jamesport, Units 1 and 2, that were reported in Issue 4 of NUREG-0138. All four of these plants are Stone and Webster/Westinghouse plants.

The NRC reviewed selected areas of ESFAS reset action on PWR facilities. In some cases, this review was limited to an examination of logic diagrams and procedures. It has been determined that logic diagrams may not adequately reflect as-built conditions; therefore, the review of drawings must be done at the schematic/elementary diagram level.

There have been several communications to licensees from the NRC on ESF reset actions. Some of these communications have been in the form of generic letters on containment venting and purging during normal operations which were issued in November 1978 and October 1979; others were in Inspection and Enforcement Bulletins 79-05, -05A, -05B, -06A, -06B, and -08 which addressed the events at TMI-2 and in NUREG-0578, TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations.

2. INTRODUCTION

On March 13, 1980, the USNRC Office of Inspection and Enforcement (I&E), issued I&E Bulletin 80-06, entitled "Engineered Safety Feature (ESF) Reset Controls," to all PWR and BWR facilities with operating licenses. I&E Bulletin 80-06 requested that the following actions be taken by the licensees:

(1) Review the drawings for all systems serving safety-related functions at the schematic/elementary diagram level to determine whether or not upon the reset of an ESFAS, all associated safety-related equipment remains in its emergency mode.

(2) Verify that the actual installed instrumentation and controls at the facility are consistent with the schematics reviewed in Item 1 above by conducting a test to demonstrate that all equipment remains in its emergency mode upon removal of the actuating signal and/or manual resetting of the various isolating or actuation signals. Provide a schedule for the performance of the testing in your response to this bulletin.

(3) If any safety-related equipment does not remain in its emergency mode upon reset of an ESF signal at your facility, describe proposed system modification, design change, or other corrective action planned to resolve the problem.

(4) Report in writing within 90 days the results of your review, include a list of all devices which respond as discussed in Item 3 above, actions taken or planned to assure adequate equipment control, and a schedule for implementation of corrective action.

This document addresses only the electrical, instrumentation and control (EI&C) design aspects of the ESF reset controls. This document covers the licensee's response to I&E Bulletin 80-06 and the licensee's proposed system modification, design change, and other corrective action planned to resolve the problem.

The I&E regional inspector/licensee response to the submitted Technical Evaluation Report (TER) will require a subsequent letter, and may require a supplemental TER.

3. REVIEW CRITERIA

The following criteria were used to evaluate the licensee's response(s):

(1) I&E Bulletin 80-06, "Engineered Safety Feature (ESF) Reset Controls."

(2) The NRC staff position requires that unless an alternative is justified by the licensee and accepted by the NRC staff, upon the reset of ESF signals (such as a safety injection actuation signal), all affected equipment shall remain in its emergency mode. If there is multiple reset sequencing, none of the reset actions shall cause the affected equipment to deviate from its emergency mode.

4. REVIEW GUIDELINES

The following guidelines were used in this review:

(1) Review and tabulate the licensee's response to I&E Bulletin 80-06 and other related documentation.

(2) Determine if the licensee's response or other related documentation addresses all of the items requested in I&E Bulletin 80-06.

(3) If additional documentation requested is not received within four months (from the date of the letter to the NRC technical contact), discontinue the review and submit a report stating that there is insufficient information.

(4) Review all submitted documentation to determine if the ESF Reset Controls satisfy the requirements of the review criteria. If it is found that the submitted documentation is inadequate, clarify those problem areas in a telephone conference call (or meeting) with the licensee. If the additional documentation requested during the conference call (or meeting) is not received within two weeks (from date of contact), discontinue the review and submit a report which treats the questionable area as a non-compliance item.

(5) Conduct a review of any licensee-proposed system modification, design change or other corrective action planned to resolve any problem areas to determine if the proposal satisfies the review criteria.

(6) If the licensee does NOT propose any corrective action for the non-compliance areas, cite their justifications or bases as a part of the report.

5. EVALUATION

In a letter dated June 9, 1980 [Ref. 1], Northern States Power Company (NSP), the licensee for Prairie Island Nuclear Generating Plant, Units 1 & 2, replied to I&E Bulletin 80-06.

Northern States Power reported that they had completed a review of the safety system schematics for Prairie Island Nuclear Generating Plant. The licensee states that safety-related equipment remains in its emergency mode upon reset of the safety signals. We conclude that the licensee has complied with Action Items 1, 3 and 4 of I&E Bulletin 80-06.

The licensee has committed to test each unit at its next refueling outage to demonstrate that the safety-related equipment stays in its emergency mode after reset. The next scheduled refueling outages are August/September, 1980 for Unit 1 and February/March, 1981 for Unit 2. We conclude that the licensee has complied with Action Item 2 of I&E Bulletin 80-06.

6. SUMMARY

Based on our review of the documents provided, we conclude that the ESF reset controls for Prairie Island Nuclear Generating Plant, Unit 1 and Unit 2 meet the requirements of the review criteria detailed in this report.

REFERENCES

1. Northern States Power Company letter (D. E. Gilberts) to NRC (J. G. Keppler), Dockets 50-282 and 50-306, no title, dated June 9, 1980.

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