June 23, 1981

Docket No. 50-245
LS05-81-06-078

Mr. W. G. Counsil, Vice President
Nuclear Engineering and Operations
Northeast Nuclear Energy Company
P. O. Box 270
Hartford, Connecticut 06101

Dear Mr. Counsil:

SUBJECT: SEP TOPIC VI-4, CONTAINMENT ISOLATION SYSTEM (ELECTRICAL), MILLSTONE UNIT 1

The staff has determined that the scope of review and evaluation performed for multi-plant generic activity B-24 includes the electrical aspects of SEP Topic VI-4. Additional review and evaluation is, therefore, not required.

Enclosed is a copy of our current evaluation of the electrical portion of generic activity B-24 for Millstone Unit 1. This assessment compares your facility, as described in Docket No. 50-245, with the criteria currently used by the regulatory staff for licensing new facilities. Please inform us if your as-built facility differs from the licensing basis assumed in our assessment within 30 days upon receipt of this letter.

This safety evaluation will be a basic input to the integrated safety assessment for your facility unless you identify changes needed to reflect the as-built conditions at your facility. The integrated safety assessment will determine if the mandated changes must be made. This assessment may be revised in the future if your facility design is changed or if NRC criteria relating to this subject are modified before the integrated assessment is completed.

In future correspondence regarding this topic, please refer to the topic number in your cover letter.

Sincerely,

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Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
Division of Licensing

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6/22/81

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

June 23, 1981

Docket No. 50-245
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ENCLOSURE

REVISED SAFETY EVALUATION REPORT

MILLSTONE UNIT 1

OVERRIDE OF CONTAINMENT PURGE ISOLATION AND OTHER ENGINEERED SAFETY FEATURE ACTUATION SIGNALS

Introduction

Instances have been reported at nuclear power plants where the intended automatic closure of the containment purge/ventilation valves during a postulated accident would not have occurred because the safety actuation signals were inadvertently overridden and/or blocked, due to design deficiencies. These instances were determined to constitute an Abnormal Occurrence (#78-5). As a follow-up action, NRR issued a generic letter requesting each licensee to take certain actions.

Evaluation

The enclosed report "Electrical, Instrumentation and Control Aspects of the Override of Containment Purge Valve Isolation," (0342J) was prepared for us by EG&G, Idaho as part of our technical assistance contract program. The report provides their technical evaluation of the design compliance with NRC-provided criteria. It identifies three areas where the ventilation and purge valves do not satisfy our criteria and one area where other engineered safety features do not satisfy our criteria.

Of the three areas where the ventilation and purge valves do not satisfy our criteria, one involves a bypass switch that is used to permit the manual override of the closure of these valves that vent the containment to the standby gas treatment system. This design provision for containment atmosphere control is an engineered safety feature that can operate only after the mode switch is changed from Run to Shutdown Mode. This bypass is acceptable.

The second area involves the use of a single bypass switch for the control of redundant isolation valves in the reactor coolant sample system. According to information supplied by the licensee, a single sample line is involved. Because of the limited potential for an inadvertent release from a single line, the staff finds the present design to be acceptable.

The third area involves a lack of adequate signals for initiation of containment isolation. In this area there are two concerns. The first concern is that the containment is not automatically isolated upon manual initiation of engineered safety features. In the Millstone design there are no provisions for system level manual initiation of any engineered safety feature. Accordingly, there is no well defined point at which manual initiation of engineered safety features can be said to occur except for opening the discharge valves. Isolation of containment everytime these valves are tested is not practical nor is providing

an additional operation bypass for containment isolation. Accordingly, the staff finds that the present design is acceptable.

The second concern is that no radiation signal is provided to initiate containment isolation. Furthermore, the licensee, in a letter dated January 2, 1979 and April 27, 1979, has provided his justification for containment purge during operation. The basic argument is that containment isolation, based upon manual initiation after a ten minute delay from receipt of a radiation alarm would result in a dose "well below" the 10 CFR 100 limit. Two cases were studied; one is a small break that is large enough to approach but not reach the 2 psig containment pressure trip point. The other case was a large LOCA with the 18 inch purge valves open.

Regardless of the purge dose calculations, IEEE Std. 279 (1968 and 1971 editions) require (in Section 4.8) that "To the extent feasible and practical, protection system inputs shall be derived from signals that are direct measures of the desired variables." The purpose of containment is to contain radioactive material. Ergo, the staff believes that the current design is not adequate, without radiation as one of the containment isolation actuation signals.

Conclusion

Based upon our review of the contractor's technical report, we conclude that the isolation circuitry for the drywell and suppression chamber ventilation and purge valves should be modified such that the valves will close automatically upon high drywell radiation.

0342J

SEP TECHNICAL EVALUATION

TOPIC VI-4
ELECTRICAL, INSTRUMENTATION, AND CONTROL ASPECTS OF
THE OVERRIDE OF CONTAINMENT PURGE VALVE ISOLATION

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 1

Docket No. 50-245

February 1981

A. C. Udy
Reliability and Statistics Branch
Engineering Analysis Division
EG&G Idaho, Inc.

Draft 2-10-81

CONTENTS

SEP TECHNICAL EVALUATION

TOPIC VI-4
ELECTRICAL, INSTRUMENTATION, AND CONTROL ASPECTS OF
THE OVERRRIDE OF CONTAINMENT PURGE VALVE ISOLATION

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 1

1.0 INTRODUCTION

Based on the information supplied by the Northeast Nuclear Energy Company (NNECo) this report addresses the electrical, instrumentation, and control systems design aspects of the Containment Ventilation Isolation (CVI) system and other related Engineered Safety Feature (ESF) functions for Millstone Unit 1.

Several instances have been reported where the automatic closure of the containment ventilation or purge isolation valves would not have occurred because the safety actuation signals were manually overridden or blocked during normal plant operations. Lack of proper management controls, procedural inadequacies, and circuit design deficiencies contributed to these instances. These events also brought into question the mechanical operability of the valves themselves. These events were determined by the Nuclear Regulatory Commission (NRC) to be an Abnormal Occurrence (#78-05) and accordingly, were reported to Congress.

The NRC is now reviewing the electrical override aspects of containment purging and venting for all operating reactors. On November 28, 1978, the NRC issued a letter, "Containment Purging During Normal Plant Operation"[1] to all Boiling Water Reactor and Pressurized Water Reactor licensees. This required a review of these systems by the licensee. NNECo responded on January 2, 1979[2], and April 27, 1979[3]. On January 20, 1981[4], NNECo provided additional information requested by the NRC. The Final Safety Analysis Report (FSAR) and a letter of January 31, 1980,[5] also contain design information reviewed for this report.

2.0 EVALUATION OF THE MILLSTONE NUCLEAR POWER STATION, UNIT 1

2.1 Review Guidelines. The intent of this evaluation is to determine if the actuating signals for the ESF equipment meet the following NRC requirements:

1. Guideline No. 1--In keeping with the requirements of General Design Criteria 55 and 56, the override[a] of one type of safety actuation signal (e.g., radiation) should not cause the blocking of any other type of safety actuation signal (e.g., pressure) for those valves that have no function besides containment isolation.

2. Guideline No. 2--Sufficient physical features (e.g., key lock switches) are to be provided to facilitate adequate administrative controls.

3. Guideline No. 3--A system level annunciation of the overridden status should be provided for every safety system impacted when any override is active.

Additionally, this review uses the following NRC design guidelines:

1. Guideline No. 4--Diverse signals should be provided to initiate isolation of the containment ventilation system. Specifically, containment high radiation, safety injection actuation, and containment high pressure (where containment high pressure is not a portion of safety injection actuation) should automatically initiate CVI.

2. Guideline No. 5--The instrumentation and control systems provided to initiate the ESF should be designed and qualified as safety grade equipment.

3. Guideline No. 6--the overriding or resetting[a] of the ESF actuation signal should not cause any valve or damper to change position.

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a. The following definitions are given for clarity of use in this evaluation:

Override: the signal is still present, and it is blocked in order to perform a function contrary to the signal.

Reset: the signal has come and gone, and the circuit is being cleared in order to return it to the normal condition.

Guideline 6 in this review applies primarily to other related ESF systems because implementation of this guideline for containment isolation will be reviewed by the Lessons Learned Task Force, based on the recommendations in NUREG-0578, Section 2.1.4. When containment isolation is not involved, consideration on a case-by-case basis of automatic valve repositioning upon reset may be considered acceptable. Acceptability would be dependent upon system function, design intent, and suitable operating procedures.

2.2 Containment Ventilation Isolation Circuits Design Description. The containment purge and vent isolation valves use solenoid-operated air pilot valves. Loss of power or air will cause the isolation valves to close. Automatic closure of containment purge and vent isolation valves will occur on any of the following conditions[4]:-

1. High drywell pressure (2 psig).
2. Low reactor water level.

NNECo has indicated[4], that these signals are derived from safety grade equipment.

There is provision for manual override of the automatic closure of the 2-in. drywell vent relief valve, suppression chamber vent relief valve, and standby gas treatment inlet valve (AC-8, AC-12, and AC-10, respectively). This override is annunciated when effected by the operation of a single key-locked switch.

2.3 Containment Ventilation Isolation System Design Evaluation. Guideline 1 requires that no signal override can prevent another safety actuation signal from functioning. All actuation signals to the 2-in. drywell vent relief valve and the suppression chamber vent relief valve can be overridden by a single key-locked switch. This guideline is not conformed with. No other containment isolation purge and vent valve actuation signals for other valves can be overridden.

Guideline 2 requires that reset and override switches have physical provisions to aid in the administrative control of these switches. The key-locked switch, previously mentioned, complies with this guideline.

Guideline 3 requires system level annunciation whenever an override affects the performance of a safety system. The use of the override is annunciated in conformance with this guideline.

Guideline 4 requires that isolation of the CVI valves be actuated by several diverse signals. This requirement is not met in that:

1. A manual safety injection will not initiate isolation
2. High radiation levels will not initiate isolation.

Guideline 5 requires that isolation actuation signals be derived from safety grade equipment. All present isolation actuation signals meet this requirement.

Guideline 6 requires that no reset of isolation logic will automatically open the isolation valves. Millstone Unit 1 is presently modifying the control circuits of four valves to comply with this guideline.[4]

2.4 Other Related Engineered Safety Feature System Circuits. A review of other related ESF circuits was also made. The sample system inboard and outboard isolation valves can be opened by a single key-locked switch when the reactor mode switch is in the shutdown position[4]. This shows potential for opening both valves due to a single failure of this switch. It does not comply with guideline 1.

No other manual overrides have been identified in the review of the material submitted for this audit.

3.0 SUMMARY

The NRC issued a letter, "Containment Purging During Normal Plant Operation," which requested NNECo to review purging requirements, controls, and procedures for purging at the Millstone station.

The electrical, instrumentation, and control design aspects of the containment ventilation isolation valves for Millstone Unit 1 were evaluated using the design gudelines stated in Section 2.1 of this report. These guidelines are satisfied except for the 2-in. drywell and suppression chamber vent relief valves where:

1. A single key-locked switch overrides all actuation signals to these valves
2. There is no actuation when a safety injection is manually actuated
3. There is no actuation when the reactor building radiation level is high.

The NRC should require that these deficiencies be corrected in conformance with the other guidelines. Other ESF systems have deficiencies as outlined in Section 2.4. The NRC should also require that these be corrected.

4.0 REFERENCES

1. NRC/DOR letter (A. Schwencer) to CP&L and all BWR and PWR licensees, "Containment Purging During Normal Plant Operation," dated November 28, 1978.
2. NNECo letter, (W. G. Counsil) to Director of Nuclear Reactor Regulation, NRC, "Containment Purging During Normal Plant Operation," January 2, 1979.
3. NNECo letter, (W. G. Counsil) to Director of Nuclear Reactor Regulation, NRC, "Containment Purging During Normal Plant Operation," April 27, 1979.

4. NNECo letter (W. G. Counsil) to Director of Nuclear Reactor Regulation, NRC, "SEP Topic VI-4--Containment Isolation System," January 20, 1981.

5. NNECo letter (W. G. Council) to Office of Nuclear Reactor Regulation, "TMI-2 Short-Term Lessons-Learned Implementation," January 31, 1980.