

TECHNICAL EVALUATION REPORT

ELECTRICAL, INSTRUMENTATION, AND CONTROL ASPECTS OF
THE OVERRIDE OF CONTAINMENT PURGE VALVE ISOLATION
AND OTHER SAFETY FEATURE SIGNALS

DONALD C. COOK NUCLEAR PLANT UNIT NOS. 1 AND 2

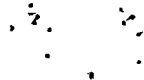
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INTERIM REPORT

ABSTRACT

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. This report addresses electrical, instrumentation, and control design aspects for these valves, and the ability of the unit containment ventilation system to isolate on several diverse parameters. Other related systems were audited to the same guidelines.

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EICS Support

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TECHNICAL EVALUATION REPORT

ELECTRICAL, INSTRUMENTATION, AND CONTROL ASPECTS OF THE OVERRRIDE OF CONTAINMENT PURGE VALVE ISOLATION AND OTHER SAFETY FEATURE SIGNALS

DONALD C. COOK NUCLEAR PLANT UNIT NOS. 1 AND 2

Revision 1

1.0 INTRODUCTION

Based on the information supplied by Indiana & Michigan Power Company (I&MP), this report addresses the electrical, instrumentation, and control systems design aspects of the Containment Ventilation Isolation (CVI) subsystem of the Primary Containment Isolation (PCI) system and other related Engineered Safety Feature (ESF) system functions for the Cook 1 and Cook 2 plants. The Final Safety Analysis Reports (FSARs) verify that these systems are identical in both plants.

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. These events resulted from procedural inadequacies, design deficiencies, and a lack of proper management controls. 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.

As a follow-up of this Abnormal Occurrence, the NRC is reviewing the electrical override aspects and the mechanical operability aspects of containment purging 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 (BWR) and Pressurized Water Reactor (PWR) licensees. I&MP responded to the letter¹ in letters dated January 4, 1979² and June 8, 1979³. A meeting⁴ was held on May 31, 1979 with I&MP and the NRC to clarify the design and characteristics of the Cook CVI and ESF

systems. I&MP declared that their interim modifications (see Reference 3) were permanent in a letter of November 8, 1979⁵. Further discussion between I&MP and the NRC by telephone conference occurred on November 16, 1979⁶, resulting in a letter to the NRC on December 5, 1979⁷. Further information was supplied in a letter of March 25, 1980.⁸

2.0 EVALUATION OF COOK NUCLEAR PLANT UNITS 1 AND 2

2.1 Review Guidelines

The intent of this evaluation is to determine if the following NRC requirements are met for the safety signals to all ESF equipment:

1. Guideline No. 1—In keeping with the requirements of General Design Criteria 55 and 56, the overriding^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.
(See R.G. 1.47.)

Incidental to this review, the following additional NRC design guidelines were used in the evaluation:

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- a. The following definition is 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.

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.

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 on 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

Each of the Cook units has two ESF trains which close independently and separately the inboard and outboard PCI valves. The valves can only be opened by manual control. Each valve has a three-position, spring return to neutral center control switch. The control circuit requires manual operation of the switch to the "open" position for the valves to open. The automatic initiating signals which override any opening signal are listed below:

a. The following definition is given for clarity of use in this evaluation:

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

1. Containment particulate activity, containment gaseous activity, or containment area monitor³ radiation levels exceeding their setpoint will result in valve closure.
2. A safety injection signal caused by either high containment pressure or low pressurizer pressure. There are other safety injection actuation signals which will result in CVI, as well as Phase A of Containment Isolation Signal⁷.

The CVI actuation signal resulting from the ESF initiation signal can be overridden from the ESF panel to allow manual opening of the CVI valves with the initiating signal still present.

The control system is such that the automatic closure signals will close the valves when the control switch is in the "open" position. Loss of power to the control system or loss of air to the solenoid valve closes the isolation valves. Valve position lights, open and closed, are provided on the control console.

Changes to the valve control circuitry were discussed with I&MP⁴ and they responded³ with the following:

1. Mechanical interference covers were provided for the reset switches, with "box car" type lead seals for the cover
2. "Reset (Blocked)" annunciators were provided for the reset of each of the following ESF functions:
 - a. Containment isolation--Phase A
 - b. Containment isolation--Phase B
 - c. Containment ventilation isolation (CVI)
 - d. Containment spray
 - e. Safety injection
 - f. Feedwater isolation
3. A signal from the containment isolation--Phase A would initiate CVI valve closure regardless of the status of the CVI override.

2.3 Containment Ventilation Isolation System Design Evaluation

Guideline 1 requires that no signal override can prevent another safety actuation signal from functioning. The interim modification to provide a containment isolation Phase A signal to override any CVI signal override satisfies this guideline^a.

Guideline 2 requires that reset and override switches have physical provisions to aid in administrative control of the switches. The momentary contact reset switches now have interference covers with "box car" type seals, thus complying with this guideline.

Guideline 3 requires that system level annunciation be provided for wherever an override affects the performance of a safety system. The Cook units conform to this guideline, as a result of their interim modification^a.

Guideline 4 requires that isolation of the CVI system be actuated by several diverse signals. The CVI is actuated by diverse signals as required by this guideline, including an actuation signal from the safety injection sequencer. Guideline 4 is satisfied.

Guideline 5 requires that isolation actuation signals be derived from safety grade equipment. The radiation signals to the CVI system are the only actuation signals that are not derived from safety grade equipment⁷ and, therefore, do not satisfy this guideline. However, I&MP is committed to upgrading these radiation monitors to safety grade⁸ during the next available outage.

Guideline 6 requires that no resetting of isolation logic will, of itself, automatically open the isolation valves. The Cook units conform to this guideline in that the valve control switches require manual operation to open the valves after the isolation logic is reset.

a. Reference 5 declares this modification to be permanent, and as such, this guideline is satisfied.

2.4 Other Related Engineered Safety Feature System Circuits

The CVI is the only portion of containment isolation where two signals were "OR"ed together to a common retentive memory with manual reset. This reset affects no other portions of containment isolation.

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

3.0 SUMMARY

The electrical, instrumentation, and control design aspects of the containment ventilation isolation valves and other related ESF signals for the D. C. Cook station were evaluated using the design guidelines stated in Section 2.1 of this report. The D. C. Cook CVI system complies with the review guidelines except for the radiation channels used to provide one of the diverse actuation signals. These radiation channels will be upgraded to safety grade equipment. The NRC should verify that they are.

4.0 REFERENCES

1. NRC/DOR letter (A. Schwencer) to all BWR and PWR licensees, "Containment Purging During Normal Plant Operation," dated November 28, 1978.
2. I&MP letter (John Tillighast) to NRC (Harold R. Denton) Docket Nos. 50-315 and 50-316, "Containment Purging During Normal Plant Operation," January 4, 1979, AEP: NRC: 00114.
3. I&MP letter (John E. Dolan) to NRC (Harold R. Denton) Docket Nos. 50-315 and 50-316, June 8, 1979, AEC: NRC: 00114A.
4. Meeting, NRC, IM&P, in Bethesda, MD, May 31, 1979, minutes issued June 12, 1979 by Dave Wigginton, NRC.
5. I&MP letter (John E. Dolan) to NRC (Harold R. Denton) Docket Nos. 50-315 and 50-316, November 8, 1979, AEP: NRC: 00295.
6. Telecon, Ray F. Scholl, Jr, NRC, Jude DelPercio and Tom King, I&MP, November 16, 1979, 2:30 p.m. EST.
7. I&MP letter (John E. Dolan) to NRC (Harold R. Denton) Docket Nos. 50-315 and 50-316, December 5, 1979, AEP: NRC: 00295A.

8. Indiana & Michigan Electric Company letter (John E. Dolen) to NRC (Harold R. Denton), Docket Nos. 50-315 and 50-316, March 25, 1980, AEP:NRC:00295B.

Safety Evaluation Report
Minimum Containment Pressure Setpoint
(Item II.E.4.2(5) of NUREG-0737)
D. C. Cook Nuclear Power Plant, Units 1 and 2
Docket Nos: 50-315, 316

1.0 Introduction

As a consequence of the accident at TMI-2, implementation of a number of new requirements has been recommended for operating reactors. These new requirements are described in NUREG-0660, "NRC Action Plan Developed as a Result of the TMI-2 Accident," May 1980, and NUREG-0737, "Clarification of TMI Action Plan Requirements," November 1980. The NRC staff has also requested licensees to submit information sufficient to permit an independent evaluation of their response to these new requirements. This report provides an evaluation of the response to Action Plan Item II.E.4.2, position 5, by the designated licensee.

2.0 Evaluation

Our consultant, the EG&G Energy Measurements Group (a subcontractor to Lawrence Livermore National Laboratory, which has the TMI Action Plan contract) has reviewed the licensee's submittals and prepared the attached technical evaluation report of the licensee's containment pressure setpoint used to isolate nonessential containment penetrations. We have reviewed this evaluation and concur in its basis and findings.

3.0 Conclusions

The information submitted by the licensee provided sufficient details of the licensee's containment isolation pressure for the staff to conclude that the requirements of Item II.E.4.2(5) of NUREG-0737, with the additional guidelines developed by the staff, have been met.