

**INTERIM REPORT**

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**Responsible NRC Individual and NRC Office or Division:** Paul Shemanski, Division of Operating Reactors

This document was prepared primarily for preliminary or internal use. It has not received full review and approval. Since there may be substantive changes, this document should not be considered final.

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**INTERIM REPORT**

NRC Research and Technical  
Assistance Report

February 1980

ELECTRICAL, INSTRUMENTATION AND CONTROL ASPECTS OF  
THE OVERRIDE OF CONTAINMENT PURGE VALVE ISOLATION  
AND OTHER SAFETY FEATURE SIGNALS, EDWIN I. HATCH  
NUCLEAR PLANT, UNIT NOS. 1 AND 2, DOCKET NOS. 50-321  
AND 50-366, TAC NOS. 10178 AND 10177

A. C. Udy

## U.S. Department of Energy

Idaho Operations Office • Idaho National Engineering Laboratory



This is an informal report intended for use as a preliminary or working document

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Electrical, Instrumentation and Control Aspects of the Override of Containment Purge Valve Isolation and Other Safety Feature Signals, Edwin I. Hatch Nuclear Plant, Unit Nos. 1 and 2, Docket Nos, 50-321 and 50-266, TAC Nos. 10178 and 10177

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Idaho Falls, Idaho **83415**

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Assistance Report

TECHNICAL EVALUATION REPORT

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

EDWIN I. HATCH NUCLEAR PLANT UNIT NOS. 1 AND 2

Docket Nos. 50-321 and 50-366  
TAC Nos. 10178/10177

February 1980

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## 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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## TECHNICAL EVALUATION REPORT

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

EDWIN I. HATCH NUCLEAR PLANT UNIT NOS. 1 AND 2

#### 1.0 INTRODUCTION

Based on the information supplied by Georgia Power Company (GPC), 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 Hatch 1 and Hatch 2 units. The Final Safety Analysis Reports verify that these systems are identical in both units.

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"<sup>1</sup> to all Boiling Water Reactor and Pressurized Water Reactor licensees to initiate a review of these systems. GPC responded in letters dated January 9, 1979<sup>2</sup> and August 29, 1979<sup>3</sup>. Information in a GPC letter of August 10, 1979<sup>4</sup> is also applicable.

A meeting was held on October 3, 1979<sup>5</sup> with the GPC and the NRC to clarify the design characteristics of the Hatch CVI and ESF systems.

GPC letters of January 9, 1980<sup>6</sup> and January 14, 1980<sup>7</sup> answered the questions that remained after that meeting.

## 2.0 EVALUATION OF HATCH 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<sup>a</sup> 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:

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

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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.



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<sup>a</sup> 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 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

Each of the Hatch units has two ESF trains which close independently and separately the inboard and outboard PCI valves. The valves are opened only by manual control. Each valve has a two-position control switch. The automatic initiating signals which override any opening signal, resulting in valve closure, are listed below:

1. Either reactor building or refueling area ventilation radiation levels exceeding high trip setpoint
2. A one-out-of-two-taken-twice logic using two drywell pressure high signals (2 psig) and two reactor vessel water level low signals (12.5 inch reference).

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

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

The actuation signal resulting from the automatic initiation signal can be reset (but not blocked), once the initiating signal is cleared, at the ESF panel; this allows manual opening of the CVI valves.

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

### 2.3 Containment Ventilation Isolation System Design Evaluation

Guideline 1 allows no signal override to prevent another safety actuation signal from functioning. The Torus two-inch vent relief valve, the Drywell two-inch vent relief valve, and the two-inch normal operator bypass line valve (Unit 2 only) are the only CVI valves capable of being opened when the PCI system isolation signal is present. Use of a keylocked bypass switch bypasses the composite (of all initiating signals) signal only when the steamline pressure is less than 8<sup>5</sup>0 psig. Any initiating signal after use of the bypass switch is ineffective; this condition is annunciated in conformance with guideline 3. Since this is not in conformance with NRC guideline 1, GPC has initiated a design change to remove the bypass capability.<sup>3,6</sup>

Guideline 2 requires reset and override switches to have physical provisions to aid in administrative control of the switches. The momentary contact valve group reset switches have no such provisions, and do not comply with this guideline. All other switches are in conformance with guideline 2.

Guideline 3 requires that system level annunciation for wherever an override affects the performance of a safety system. The Hatch units conform to this guideline, as mentioned above.

Guideline 4 requires that isolation of the CVI system be actuated by several diverse signals. The Hatch units meet this requirement in that (a) the same signals that initiate safety injection also initiate the PCI system, (b) the reactor building pressure is a portion of this signal, and (c) radiation trips in either the reactor building or in the refueling floor areas will cause isolation.

Guideline 5 requires isolation actuation signals to be derived from safety grade equipment. The Hatch units conform to this guideline.<sup>5</sup>

Guideline 6 requires that resetting of isolation logic will not, of itself, automatically open the isolation valves. The Hatch units do not conform to this guideline. The valves are controlled by rotary, maintained contact switches. Should the valve control switch be in the open position when the valve group reset switch is actuated (with no signals calling for closure), the valves would automatically reopen. The opening of the isolation valves is annunciated. GPC, recognizing this problem, instituted administrative controls requiring that the valve control switches be in the closed position prior to resetting the valve group logic<sup>4</sup>. A briefly described design change has been made in this logic requiring that all valve control switches be in the closed position before the logic can be reset. This modification satisfies this guideline. GPC will later install momentary contact, spring return to neutral switches to control valve position. This will relieve the operator from checking each valve control switch prior to resetting the actuation logic. These are to be installed when parts are available, and after installation, guideline 6 will still be satisfied. GPC has not yet documented these design changes or when they were (or will be) made. The NRC should require the GPC to document these modifications with as-built drawings and descriptions to comply with the information requirements of Section 7.3 of Regulatory Guide 1.70, Revision 2.

GPC noted in their review<sup>3</sup> that the 2-in. post LOCA purge valves of Unit 1 would not close as a result of an isolation signal. GPC has initiated a design change that will cause these valves to close on the

same valve group isolation signal that closes the other containment ventilation valves. GPC indicated that Unit 2 does not have this design deficiency.

#### 2.4 Other Related Engineered Safety Feature System Circuits

The design of the containment spray system requires that the system lines through containment be open when the spray is operating.<sup>3</sup> To achieve this, the Hatch units have a keylocked switch for each containment spray injection valve and separate override keylock switches to the PCI actuation signals (one-out-of-two-taken-twice logic, composed of low reactor water level and high drywell pressure) to the containment spray valves. Using these switches allows, as long as the reactor vessel water level is above the low-low setpoint, the containment spray to be manually initiated. The bypass is removed and valves closed automatically should the reactor vessel water level drop below the low-low setpoint. The bypass can also be manually removed by use of the keylocked switch.

This design satisfies guideline 1 because this is an engineered safety feature system, and its use has functions other than containment isolation. The design satisfies the other applicable guidelines.

No other manual override capability has been identified in the review of the material submitted by GPC 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 Hatch units were evaluated using the design guidelines stated in Section 2.1 of this report. After either modification proposed by GPC (interlocking the valve control switches with the actuation logic reset as presently constituted or using three-position, spring return to neutral valve control switches which GPC classifies as the optimum fix), the CVI system complies with the NRC guidelines except for the

unprotected valve group reset switches. GPC should cover or provide other physical features to aid in the administrative control of these switches at both Hatch units. The NRC should also require the GPC to document the modifications made to the valve control switch and isolation reset logic.

#### 4.) REFERENCES

1. NRC/DOR letter, A. Schwencer, to all BWR and PWR licensees, "Containment Purging During Normal Plant Operation," dated November 28, 1978.
2. GPC letter, Chas. F. Whitmer, to Director of Nuclear Regulatory Commission, "Containment Purging During Normal Plant Operation", Edwin I. Hatch Nuclear Plant, Units 1 and 2, NRC Dockets 50-331 and 50-366, January 9, 1979.
3. GPC letter, R. J. Kelly, to Director of Nuclear Regulatory Commission, "Containment Purging During Normal Plant Operation", Edwin I. Hatch Nuclear Plant, Units 1 and 2, NRC Dockets 50-331 and 50-366, August 29, 1979.
4. GPC letter, R. J. Kelly, to Director of Nuclear Regulatory Commission, "I & E Bulliten 79-08--Additional Information", Edwin I. Hatch Nuclear Plant, Units 1 and 2, NRC Dockets 50-331 and 50-366, August 10, 1979.
5. Meeting, NRC, GPC at MNBB in Bethesda, MD, October 4, 1979.
6. GPC letter, R. J. Kelly, to U.S. Nuclear Regulatory Commission, "Containment Purging and Venting During Normal Operation," Edwin I. Hatch Nuclear Plant Units 1, and 2, NRC Dockets 50-321 and 50-366, January 9, 1980.
7. GPC letter, R. J. Kelly, to Director of Nuclear Regulatory Commission, "Response to Show Cause Order of January 2, 1980," Edwin I. Hatch Nuclear Plant Unit 2, NRC Docket No. 50-366, January 14, 1980.