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**INTERIM REPORT** 

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# TECHNICAL EVALUATION REPORT

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

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

Docket No. 50-333

September 1980

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A. C. Udy EG&G Idaho, Inc. 1205F

## ABSIRACT

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 ventilatic, system to isolate on several diverse parameters. Other related safety systems were audited to the same guidelines.

While the licensee has responded to NRC requests for information, the information presently available is insufficient to complete this review. The licensee also needs to commit to circuit modifications to remove an identified design deficiency.

> FIN No. A6256 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

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

### 1.0 INTRODUCTION

Based on the information supplied by the Power Authority of the State of New York (PASNY), this report addresses the electrical, instrumentation, and control system design aspects of the Containment Ventilation Isolation (CVI) subsystem of the Primary Containment Isolation (PCI) system and other related Engineered Safety Feature (ZSF) functions for the FitzPatrick plant.

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 Cuespress.

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 (BWR) and Pressurized Water Reactor (PWR) licensees. The PASNY responded to the letter and a later request for information<sup>2</sup> in letters of January 9, 1979<sup>3</sup>, March 2, 1979<sup>4</sup>, August 15, 1979<sup>5</sup>, and March 19, 1980<sup>6</sup>. Conversations between the NRC project manager and the licensee have been unsuccessful in clarifying the information submitted. Subsequently, on June 19, 1980, we requested written clarification of information and a committment to correct a design deficiency.<sup>7</sup> A 30-day response was requested; no reply has been recieved.

#### 2.0 EVALUATION OF FITZPATRICK NUCLEAR POWER PLANT

### 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:

- 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.
- Guideline No. 2--Sufficient physical features (e.g., key lock switches) are to be provided to facilitate adequate administrative controls.
- Guideline No. 3--A system level annunciation of the overridden status should be provided for every safety system impacted when any override is active.

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

 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.

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.

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

The FitzPatrick plant has two ESF trains which close independently and separately the inboard and outboard PCI valves.<sup>6</sup> The valves can only be opened by manual control. Each CVI valve has a single springreturn-to-neutral switch that controls the valve position. The isolation signal for the CVI valves is derived from the following automatic signals<sup>6</sup>:

- 1. Drywell pressure high ( 2.7 psig)
- 2. Reactor water level low ( 12.5 in.)
- Reactor building common ventilation exhaust radiation high (900 cpm)
- Both radiation monitors for reactor building common ventilation exhaust (17 RIS-452A & B) failed.

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. There is no indication from the PASNY submittals that a system-level switch is provided to close all the CVI valves; only the individual control switches are provided to close the valves manually.

For those CVI values that are solenoid operated, loss of power to the control system or loss of air to the solenoid value closes the isolation values. For those that are motor-operated, the last position of the value is maintained on loss of power. Value position lights, open and closed, are provided on the control panel.

Each train CVI isolation signal can be reset and overridden by separate keylocked switches on the Primary Containment Purge and Inerting Panel to allow manual opening of the CVI valves.<sup>6</sup> The unit Final Safety Analysis Report indicates that the drywell pressure high and reactor water level low signals are the same signals used to actuate high pressure coolant injection.

Because of the operating characteristics of the valve position control switches, operator action is required to open the CVI valves after a system level reset of the valve logic.

## 2.3 Containment Ventilation Isolation System Design Evaluation

Guideline 1 requires that no signal override can prevent another salety actuation signal from functioning. Use of a keylocked emergency manual override switch bypasses the composite (of all initiating signals) signal for the Containment Ventilation Isolation valves for that train. In violation of guideline 1, any further initiating signal is then ineffective. When this switch is in the bypass mode, it is annunciated in conformance with guideline 3.

Guideline 2 requires that reset and override switches have physical provisions to aid in administrative control of the switches. The override switches are keylocked. The momentary contact reset switches have not been shown to be protected; however, where a reset switch does not override a signal, physical protection may not be needed. Therefore, complete compliance with this guideline is questioned.

Guideline 3 requires that system level annunciation be provided for whenever an override affects the performance of a safety system. The FitzPatrick plant conforms to this guideline, as mentioned above.

Guideline 4 requires that isolation of the CVI system be actuated by several diverse signals. The FitzPatrick plant meets this requirement in that (a) the same signals that init'ate safety injection also initiate the PCI system, (b) the reactor containment (i.e., drywell) pressure is a portion of this signal, and (c) radiation trips of the reactor building exhaust monitor will cause isolation.

Guideline 5 requires that isolation actuation signals be derived from safety grade equipment. The FitzPatrick signals used for CVI conform to this guideline.<sup>6</sup>

Guideline 6 requires that no resetting of isolation logic will, of itself, automatically open the isolation valves. The FitzPatrick plant conforms to this guideline.

## 2.4 Other Related Engineered Safety Feature System Circuits

Guideline 2 requires that reset and override switches have physical provisions to aid in the administrative control of these switches. While those override controls that use keylocked switches meet this guideline, those that use pushbutton switches have not been demonstrated to have such provisions. The NRC should require that PASNY install any additional provisions needed to conform to guideline 2.

Reference 5 reviews the safety systems that have override capability. It is stated that "none of these overrides or bypasses deviate from the NRC requirements of Reg. Guide 1.47 relative to administrative control and annunciation." However, PASNY has not made clear that they are in compliance with guideline 3 for other related ESF circuits. The NRC should determine whether each ESF override is annunciated

Incidental to this review, it is noted that the PASNY indicated "improper suction valve alignment will prevent the residual heat removal pumps from starting."<sup>5</sup> The NRC should require the PASNY to provide annunciation when these valves are improperly aligned.

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 for the FitzPatrick unit were evaluated using the design guidelines stated in Section 2.1 of this report.

The keylocked bypass switches for the containment ventilation isolation valves have been shown to be annunciated. Isolation is actuated by safety-grade signals derived from safety injection (including seactor containment pressure) and high radiation levels in the reactor building exhaust. It is not clear from the licensee submittals that this monitors the containment exhaust. The licensee has shown that no reset of the actuation logic will cause the isolation valves to change position. NRC guidelines 4, 5, and 6 are fully complied with.

Based on the information available at this time, I have determined that:

- 1. Each train of isolation has one override switch that bypasses all automatic CVI actuation signals. This is not in conformance with NRC guideline 1.
- The logic reset switches of the James A. FitzPatrick ESF system (including those for the CVI system) have not been shown to have physical features to prevent inadvertant operation (NRC guideline 2).

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3. It is not clear that all ESF overrides are annunciated in conformance with guideline 3, rather than tagged as permitted by RG 1.47 for infrequently-used bypasses. The CVI override switches are annunciated.

Therefore, it is recommended that the James A. FitzPatrick Nuclear Power Plant be required to:

- Make the design changes necessary so that one keylocked switch will not override all isolation signals to a train of the CVI valves.
- Determine what physical provisions are provided for all ESF (including CVI) system level reset switches. Where provisions are not provided to aid in the administrative control of these switches, they should be provided by the PASNY.
- Supply, as needed, annunciation for each manual override within the ESF system, when the override is active.

Additionally, while not directly related to this review, the NRC should also determine if an improper suction valve alignment preventing the start of the residual heat removal pumps requires annunciation or some interlocks to prevent the condition from occurring.

#### 4.0 F.J. TERENCES

- NRC/DOR letter (A. Schwencer) to all BWR and PWR licensees, "Containment Purging During Normal Plant Operation," dated November 28, 1978.
- EG&G Idaho, Inc., letter, A.C. Udy, to J. T. Beard, U.S. NRC, "James A. FitzPatrick--Containment Purging, Preliminary Review," September 13, 1979.
- PASNY letter, Paul J. Early, to Director of Nuclear Regulatory Commission, "Containment Purging During Normal Plant Operation", James A. FitzPatrick Nuclear Power Plant, Docket 50-333, January 9, 1979, JPN-79-3.
- PASNY letter, Joseph R. Schnieder, to Director of Nuclear Regulatory Commission, "Containment Purging During Normal Plant Operation", James A. FitzPatrick Nuclear Power Plant, Docket 50-333, March 2, 1979, JPN-79-10.

- PASNY letter, Paul J. Early, to Director of Nuclear Regulatory Commision, "Justification for Continued Containment Purging During Normal Plant Operation," August 15, 1979, JPN-79-50.
- PASNY letter, Paul J. Early, to Director of Nuclear Reactor Regulation, "Response to NRC Request for Additional Information for the Containment Purge and Vent System," March 19, 1980, JPN-80-16.
- EG&G Idaho, Inc., telecopy, A. C. Udy to P. Polk, U.S. NRC, "Questions on the Override of ESF Signals," June 19, 1980.

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