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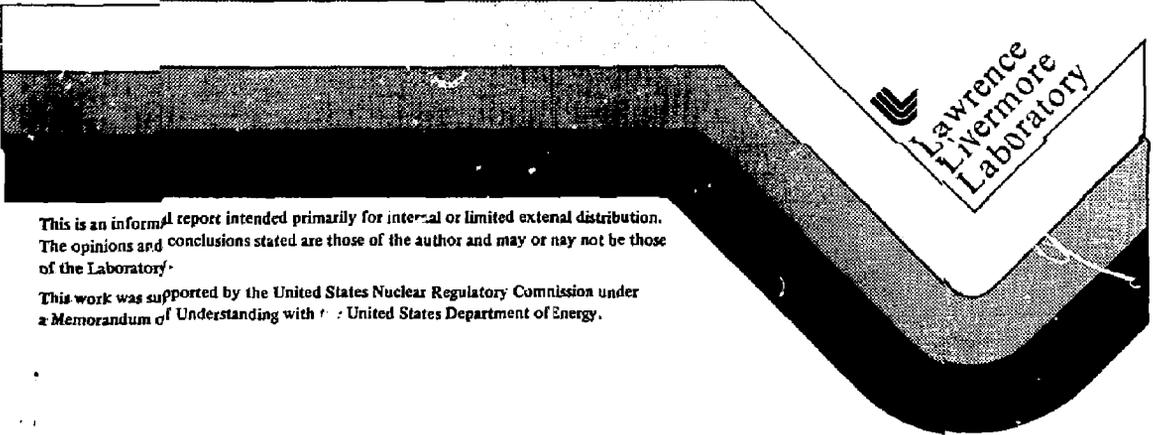
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TECHNICAL EVALUATION OF THE  
NOISE AND ISOLATION TESTING OF THE  
SAFETY FEATURES ACTUATION SYSTEM AT  
THE DAVIS BESSE NUCLEAR POWER STATION  
UNIT 1

James C. Selar

(Docket No. 50-346)

July 1, 1981



Lawrence  
Livermore  
Laboratory

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## ABSTRACT

This report documents the technical evaluation of the noise and isolation testing of the safety features actuation system at the Davis Besse Nuclear Power Station, Unit 1. The tests were to verify that faults on the non-Class 1E circuits would not propagate to the Class 1E circuits and degrade them below acceptable levels.

The tests conducted demonstrated that the safety features actuation system did not degrade below acceptable levels nor was the system's ability to perform its protective functions affected.

## FOREWORD

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

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DISCLAIMER

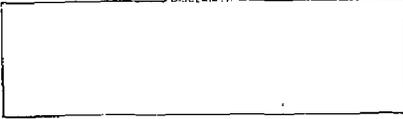


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UNIT 1

(Docket No. 50-340)

James C. Selan  
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1. INTRODUCTION

By letters dated November 10, 1980 [Ref. 1], and March 4, 1981 [Ref. 2], the Toledo Edison Company submitted test results from noise and isolation testing of the Davis Besse Nuclear Power Station's safety features actuation system (SFAS). The tests were required by Amendment No. 7 to the License Condition 2.c.(3)(k) which the NRC issued November 9, 1977.

The purpose of the tests was to demonstrate that faults and interference noise on non-Class 1E circuits would not propagate to the Class 1E circuits and degrade them below acceptable levels and to determine that selected system isolation devices will withstand the interference noise. The testing was done in accordance with plant test methods previously submitted and approved by the NRC.

The purpose of this report is to evaluate the licensee's submittal with respect to the NRC requirements.

2. EVALUATION

2.1 Test Description

The scope of the testing is to demonstrate that the isolation capability of the digital and analog isolation devices are not degraded to unacceptable levels following the inadvertent application of postulated

electrical fault in excess of normal operating currents. Also, the testing is to demonstrate that due to the intermix of non-Class 1E and Class 1E signal wiring, postulated electrical faults appearing on the non-Class 1E circuitry will not produce unacceptable effects in the Class 1E circuitry by means of mutual inductance and/or capacitive coupling.

The isolation device testing consisted of testing one of each type of device used in the SFAS Class 1E to non-Class 1E circuitry, while system testing consisted of utilizing one complete channel of the SFAS.

The licensee submitted complete test procedures, specifications, and test data for the tests conducted [Refs. 1 and 2].

## 2.2 Analysis

This section presents a synopsis of the tests conducted and the results of the tests.

### 2.2.1 Digital Isolation Device Testing

The three isolation devices subjected to the tests were the Clare Relay (KEL4318), the 6N81 bistable module, and the 6N83 output module. The results of the tests are as follows [Ref. 2]:

#### (1) Clare Relay

The licensee states that the application of either fault voltage or current to the relay contacts produced no discernable effect on the Class 1E (coil) side of the relay. The input/output dielectric strength was not degraded below the system specification due to the fault application. The relay was tested to failure which produced no effect on the Class 1E circuitry or dielectric strength.

#### (2) 6N81 Bistable Module

The licensee states that the application of the postulated faults to the output contacts of the 6N81 relay caused no inadvertent trips or resets of the bistable module.

#### (3) 6N83 Output Module

The licensee states that the application of the postulated faults to the output (non-Class 1E) contacts of the 6N83 relay caused no inadvertent trips or resets of the output module or relay.

### 2.2.2 Analog Isolation Device Testing

The device subjected to the tests was a KD978 Fischer Porter I/I, current-to-current isolator. The licensee states that the application of the postulated faults to the isolated (non-Class 1E) output produces no increase in noise on the input 4-20ma loop when the loop is supplied by a constant current source.

### 2.2.3 SFAS Noise and Isolation Testing

The modules for the containment pressure and reactor coolant systems were subjected to analog and digital electrical faults (current and voltage). The licensee states that the application of either fault voltage or current to the non-Class 1E output signal wiring caused no inadvertent trips, resets, or reactions of the system modules.

## CONCLUSION

Based on the information submitted by Toledo Edison Company for the Davis Besse Nuclear Power Station, Unit 1, and my review of the test procedures, specifications, and test results, it is concluded that:

- (1) No significant degradation to the Class 1E circuitry occurred as a result of the fault tests.
- (2) No spurious trips or resets of the relays occurred as a result of the fault tests.
- (3) No spurious trips, resets, or reactions of the SFAS system occurred as a result of the fault tests.

Accordingly, I recommend that the NRC approve the isolation and testing of the SFAS, which demonstrates that electrical faults on the non-Class 1E circuits do not propagate to the Class 1E circuits and degrade them below acceptable levels nor affect the system's ability to perform its protective functions. This testing meets the requirements of License Condition 2.c.(3)(k).

#### REFERENCES

1. Toledo Edison Company letter (R.P. Crouse) to NRC (R. W. Reid), dated November 10, 1980.
2. Toledo Edison Company letter and attachments (R.P. Crouse) to NRC (John F. Stolz), dated March 24, 1981.