NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

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August 12, 1988

Docket No. 50-423
B12998
Re: 10CFR50.62

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

References: (1) E. L. Doolittle letter to J. F. Opeka, Request for Additional Information--ATWS, dated October 14, 1986.

(2) E. J. Mroczka letter to U.S. Nuclear Regulatory Commission, ATWS Rule--Plant-Specific Information ATWS AMSAC Design, dated April 20, 1988.

(3) E. J. Mroczka letter to U.S. Nuclear Regulatory Commission, ATWS Rule--Plant-Specific Information, ATWS AMSAC Design, dated July 14, 1988.

(4) E. J. Mroczka letter to U.S. Nuclear Regulatory Commission, ATWS Rule--Plant-Specific Information, ATWS AMSAC Design, dated July 26, 1988.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 3
ATWS Rule--Plant-Specific Information
ATWS Mitigation System Actuation Circuitry (AMSAC) Design

On October 14, 1986 (Reference (1)), the NRC informed Northeast Nuclear Energy Company (NNECO) that the Staff had completed its review of the Westinghouse Owners' Group (WOG) Topical Report WCAP-10858, "AMSAC Generic Design Package," submitted in response to 10CFR50.62, "Requirements for Reduction of Risk From Anticipated Transients Without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants," and concluded that the generic design is acceptable.

However, the NRC, in their safety evaluation contained in Reference (1), identified 14 items that must be addressed on a plant-specific basis prior to the implementation of plant-specific designs required to be in compliance with the ATWS rule requirements. In Reference (2), NNECO provided responses to the 14 items requested in the NRC's Safety Evaluation of the AMSAC generic design for Millstone Unit No. 3. Subsequently, the revised responses to Items ., 6, 9, 11, and 12 concerning plant-specific details regarding ATWS AMSAC design were sent in References (3) and (4).

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The enclosed supplemental information (Appendix A [Revision 3]) concerning the testing of the Struthers-Dunn relays as an isolation device for the output circuits of the Millstone Unit No. 3 AMSAC is being sent in response to the Staff's request made during a telephone conference between the NRC Staff and NNECO representatives on August 8, 1988.

If there are any questions regarding this submittal, please contact our licensing representative directly.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

E. J. Mroczka
Senior Vice President

By: J. F. Opeka
Executive Vice President

cc: W. T. Russell, Region I Administrator
D. H. Jaffe, NRC Project Manager, Millstone Unit Nos. 2 and 3
W. J. Raymond, Senior Resident Inspector, Millstone Unit Nos. 1, 2, and 3

APPENDIX A
AMSAC ISOLATION DEVICE

Electrical independence of AMSAC from the existing RTS is provided through several means for Millstone Unit No. 3. A block diagram showing the relationship of AMSAC to the existing RTS is provided in Figure 4 which details the AMSAC/RTS connections and points of isolation.

The steam generator narrow-range level inputs to AMSAC are derived from existing isolated signals from the process protection system. These signals are provided from differential pressure transmitters to the process protection cabinet to AMSAC. This arrangement does not require the use of new isolators to provide electrical independence of these instrument channels from the existing RTS. However, to prevent overloading of the existing current loops, several isolators of the existing type were added.

For measuring turbine load at the first stage, NNECO has elected to utilize the existing pressure transmitters. As with the narrow-range steam generator inputs, the isolated signals are from the process protection cabinet.

Isolation is provided in the process protection cabinet for the signals used as input for AMSAC. As reported in WCAP-9982A, Westinghouse 7300 Series Process Control System Noise Tests, these isolation devices, which are powered by a Class 1E source, have been tested to demonstrate that the device is acceptable for its application. The purpose of the tests was to determine whether or not protection circuitry could be perturbed to the extent that protective action would be prevented by the pickup or presence of credible interference on control wiring in close proximity to protection wiring within the process control racks. Isolation devices are used in the Process Control Systems 7300 Series equipment to electrically isolate the protection circuits inside the process control racks from control circuits outside the cabinets. The system was subjected to tests that included magnetic noise tests, output cable voltage faults (maximum credible voltages: 550 VAC, 250 VDC), cross-talk, random noise, etc. The acceptance criteria for these tests were (a) the postulated fault should not prevent required protective action, and (b) spurious protective action caused by the postulated fault should be acceptable. Rev. 1

As mentioned, the subject of interferences that could negate protective actions was covered in various tests carried out for the WCAP for the Westinghouse 7300 Series Process Control System Noise Tests. This report includes a series of tests that were performed before any faults or circuity abnormalities were applied. These tests were carried out to demonstrate that a credible perturbation in the control wiring would not degrade protection action or be reflected back into the protection wiring. Any of these interferences (i.e., noise, cross-talk, etc.) that would be generated by AMSAC falls under the same category as those tested for the test report. Since AMSAC is separate from the RTS and the cable is not routed in an area that exceeds the 550 VAC and 250 VDC test limits, any interference from AMSAC would not affect the RTS.

Under all tested conditions, the protection circuitry operated as intended. The test showed conclusively that electrical interference imposed onto the isolator output wiring (control wiring) is not a consideration as to the proper operation of the perturbed channel nor any adjacent channels. The recordings verified that the interference imposed onto the control wiring was not induced into the protection wiring. The magnitude of the electrical interference introduced into the system and the stringent test procedures far exceeded any conditions that would be present in actual plant operations.

Relays are provided at the output of AMSAC for isolating the non-Class 1E AMSAC circuits from the Class 1E final actuator circuits. For Millstone, the AMSAC outputs are provided from separate relay panels within the AMSAC cabinet. Separation of the Train A, B, and non-Class 1E circuits within the AMSAC cabinet is achieved through a combination of metal barriers, conduit, and distance. These relays have been tested with a maximum credible fault applied to the relay coil in the transverse mode. Tests have been performed with the relay coil operating contact in both the open and closed position. Figure 5 depicts the simplified diagram of this output isolation circuit, and point of application for the maximum credible faults. Details of the actual tests, fault levels and their origin, test data, and pass/fail acceptance criteria will be submitted in the AMSAC Equipment Qualification Report.

Additionally, the SER requires that the isolation devices comply with the environmental qualifications (10CFR50.49) and with the seismic qualifications which were the basis for plant licensing. The isolation device at the output of AMSAC is the boundary between safety-related and nonsafety-related circuits and therefore must be qualified. For the Millstone configuration, the AMSAC output isolation device will be qualified in accordance with the current Westinghouse seismic qualification program. Rev.1

This program has developed and implemented the requirements of IEEE-344-1975, "IEEE Standard for Seismic Qualification of Class 1E Electrical Equipment for Nuclear Power Generating Stations," for Westinghouse-supplied instrumentation and control systems. The isolations provided at the protection system have been seismically qualified. Environmental Qualification Reports, however, are not applicable to the AMSAC output relays since these are located in a mild environment. The methodology for qualification is contained in WCAP-8587, Revision 6.A (Methodology for Qualifying Westinghouse WRD-Supplied NSSS Safety-Related Electrical Equipment).

The Class 1E loads operated by the isolation relay contacts are powered from a Class 1E source. The plant-specific details of the wiring configuration can be found on the Millstone Unit No. 3 elementary drawings if needed.

A series of tests have been completed at the Westinghouse Technology and Training Center to determine the isolation capability of the Struthers-Dunn Type 219 plug-in relay. This relay is used in the output of the ATWS AMSAC for isolating the non-Class 1E AMSAC circuits (relay coil) from the Class 1E final actuation circuits (relay contacts).

Three Type 219 relays with four single-break, double-throw (4PDT) contacts built to Westinghouse Design Specification 405A10 were taken from stock for this series of tests. Testing was done between November 10 and 25, 1987.

Following is a brief summary of the test results.

APPENDIX A
AMSAC ISOLATION DEVICE
(continued)

Test 1

- o Hypot using 1500 VAC across open contacts (wired in series) to coil.
- o Hypot tester was factory set to alarm when leakage current exceeded 1 mA.
- o No alarm on any relay.

Test 2

- o Meggered, using 60 VDC, from coil to frame, each contact to frame, each contact to coil, and each contact to contact.
- o Lowest resistance--30,000 MOhm, contact to contact.

Test 3

- o 582 VAC across open contacts (wired in series) to coil.
- o Lowest leakage impedance--47.5 MOhm.

Test 4

- o 582 VAC across open contacts (wired in series) to frame.
- o Lowest leakage impedance--42.5 MOhm.
- o Greatest induced coil voltage--0.29 mV.

Test 5

- o 582 VAC across sets of open contacts.
- o Lowest leakage impedance--70.8 MOhm.

Test 6

- o 582 VAC across open contacts wired in parallel.
- o Lowest leakage impedance--26.0 MOhm.
- o Highest induced coil voltage--2.0 mV.

Test 7

- o 590 VAC across the coil.

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o Results.

Relay Number	Time for Coil to Open (Seconds)	Induced Contact Voltage: Digital Multimeter (Volts)	Induced Contact Voltage: Recorder Trace (Volts)
1	19.45	Not Observed	0.731
2	19.92	0.618	0.774
3	20.40	1.40	1.032

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o All the by-products resulting from the coil burning open were contained within the clear polycarbonate relay cover.

o The cover was warm to the touch immediately after the coil burned open.

For this test (Figure 1A), the relays had been tested with the maximum credible fault (MCF) of 590 VAC applied to the relay coil in the transverse mode. A normally closed contact was connected to a strip chart to determine the duration of the relay actuation (if any) during application of a fault to the relay coil and to measure the resulting induced voltage on the contact. A second normally closed contact was connected to a DVM to measure induced voltage on the contact for tests on relays 2 and 3. The fault voltage and induced voltage were measured and recorded as listed above.

For each of the relay test cases, the fault current passed through the relay coils was in the range of 0.38 to 1.08 amperes and was limited by the coil impedance itself.

The relays clearly demonstrated their isolation capability by limiting any propagation of the faulted conditions from the non-Class 1E coil to the Class 1E contacts to a negligible value. This induced contact voltage (maximum of 1.4 volts) was not large enough to cause damage to components found in the Millstone Unit No. 3 protection circuits to which AMSAC will be connected, and clearly showed that testing did not exceed 20-ampere limit as depicted in Figure 1 for the 20-ampere fuse. As stated previously, NNECO has procured the AMSAC design from Westinghouse along with the complete qualification package. NNECO has verified that based on the test data presented in the report, the test parameters envelope the maximum voltage and current the Millstone Unit No. 3 AMSAC system could be subjected to. Based upon the performed tests, the Struthers-Dunn relay was demonstrated to be an effective isolation device for the output circuits of the Millstone Unit No. 3 AMSAC.

Rev. 2

Rev. 3

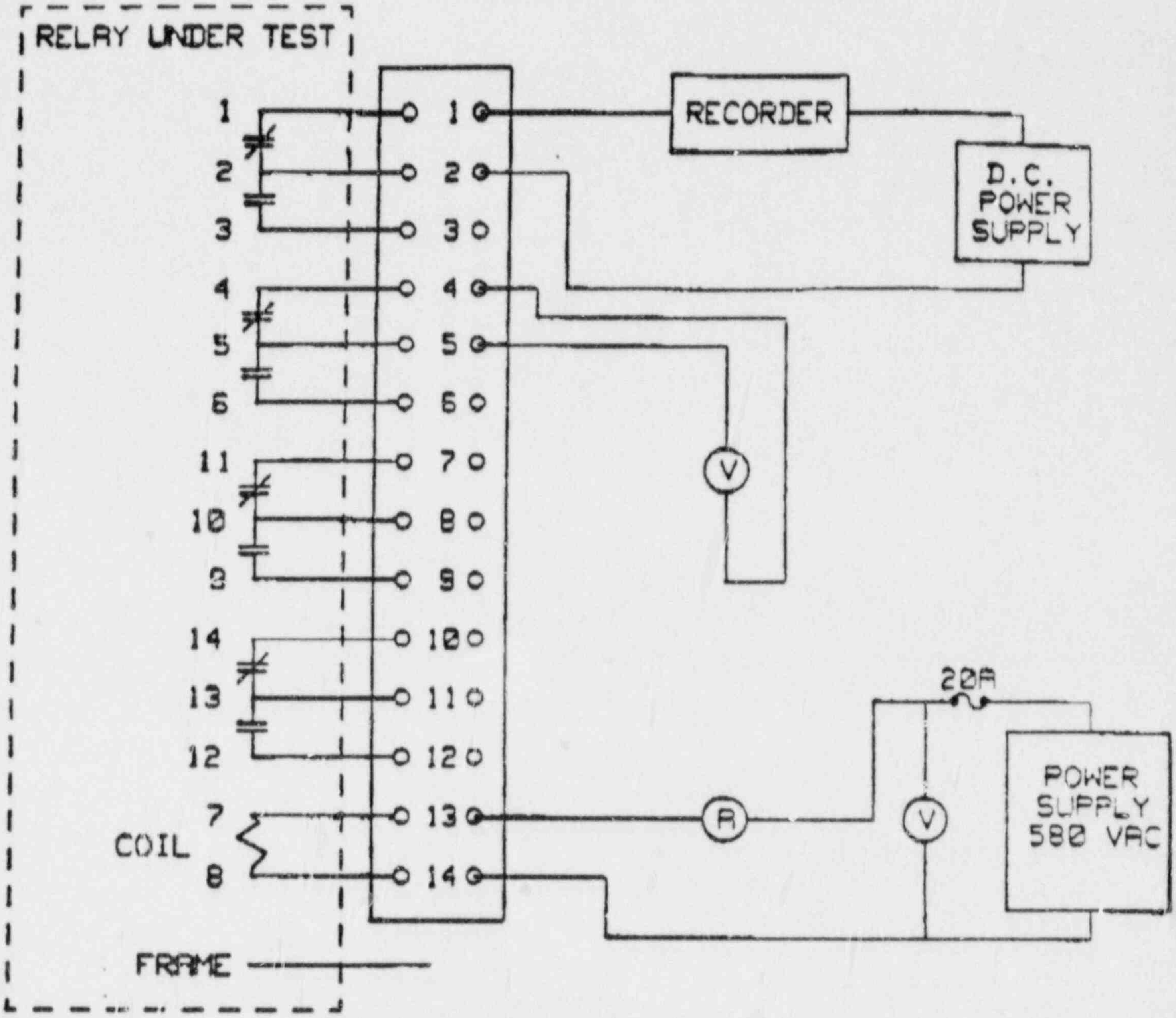

FIGURE 1A -- COIL TO CONTACT INDUCED VOLTAGE