

NORTHEAST UTILITIES

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

General Offices • Seiden Street, Berlin, Connecticut

P.O. BOX 270
HARTFORD, CONNECTICUT 06141-0270
(203) 665-5000

October 16, 1985

Docket No. 50-245
B11807

Director of Nuclear Reactor Regulation
Attn: Mr. Christopher I. Grimes, Chief
Systematic Evaluation Program Branch
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

- References: (1) J. F. Opeka letter to C. I. Grimes, dated May 17, 1985.
(2) H. L. Thompson letter to J. F. Opeka, dated July 31, 1985.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 1
Integrated Safety Assessment Program

In Reference (1), Northeast Nuclear Energy Company (NNECO) provided a proposed scope for the Integrated Safety Assessment Program (ISAP) review of Millstone Unit No. 1. In Reference (2), the Staff formally issued the results of the ISAP screening review process, establishing the scope of ISAP for Millstone Unit No. 1 and initiating issue-specific evaluations. Reference (1) also indicated that for each issue or topic included in ISAP, NNECO would provide a discussion of the safety objective and an evaluation of the plant design with respect to the issue being addressed to identify specific terms to be considered in the integrated assessment. In accordance with this commitment, the review for the following ISAP topic is attached:

- o ISAP Topic 1.22 - "Electrical Isolation"

If you have any questions concerning the attached review, please contact us.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

J. F. Opeka

J. F. Opeka
Senior Vice President

8510240078 851016
PDR ADOCK 05000245
P PDR

C. F. Sears

By: C. F. Sears
Vice President

cc: J. A. Zwolinski

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ISAP TOPIC NO. 1.22

ELECTRICAL ISOLATION

October 1985

ISAP Topic 1.22
Electrical Isolation

I. Introduction

Non-safety-related systems generally receive control signals from the reactor protection system sensor current loops. These non-safety-related circuits are required by current licensing criteria to have isolation devices to ensure the independence of the reactor protection system channels. SEP Topic VII-1.A, "Isolation of Reactor Protection System from Non-safety Systems, Including Qualification of Isolation Devices," reviewed this issue for Millstone Unit 1.

II. Criteria

10CFR50, Appendix A, General Design Criterion 24
IEEE 279-1971, "Criteria for Protection Systems for Nuclear Power
Generating Stations"

III. Related Topics/Interfaces

None.

IV. Evaluation

SEP Topics VII-1.A, "Isolation of Reactor Protection System from Nonsafety Systems" and VII-2, "ESF System Control Logic and Design" reviewed electrical isolation provisions at Millstone Unit 1. These reviews, References (1) and (2), concluded that the existing plant design met current licensing criteria, with the following exceptions:

1. There are no isolation devices between the nuclear flux monitoring systems and the process recorders and indicating instruments.
2. Isolation devices are not provided to isolate the APRM system from the process computer.
3. The power supplies for the RPS channels do not qualify as IE equipment. Isolation between each RPS channel and its respective power supply is inadequate.
4. Isolation devices are not provided to isolate the main steam-line radiation monitors from non-safety-related indicators and recorders.

Regarding item 3 above, Section 4.2.5.2 of Reference (3) concluded that modifications already implemented at Millstone Unit 1 were adequate to resolve the issue, and this item is closed.

Regarding item 4 above, in Reference (4) NNECO described testing performed on the main steam-line radiation monitors which showed that adequate isolation presently exists. This was accepted by the Staff in Reference (5). However, NNECO has recently conducted an additional review of Millstone Unit 1 SEP Safety Evaluation Reports to verify their

technical accuracy. In the case of this topic, the review concluded that the testing performed by NNECO might not have accurately tested all possible faults which could result in erroneous signals. However, we note that these monitors utilize the same circuitry as items 1 and 2, above, and the justification (described below) for these items is applicable also to the main steam-line radiation monitors and provides assurance that isolation is not a safety concern for these monitors.

In response to items 1 and 2, above, NNECO provided Reference (6) which concluded the following:

The nuclear flux monitoring systems use a 0-10 volt process signal level from which a 0-1 volt process recorder output and a 0-160 millivolt process computer output are derived from a resistive voltage divider circuit. Tests conducted by NNECO indicate that hot shorts to the recorder (or computer) output would have a negligible effect on the trip point over a range of +120 volts to -30 volts. Voltages above +120 volts resulted in a trip, so a 120 volt AC hot short (170 volt peak) would cause a trip to occur. Application of voltages less than -30 volts were less conservative. Various isolation devices, including fuses, could protect the tripping function; however, qualified devices for this application have not been found. Calculations indicate that less than 20 milliamperes would flow in the safety-related circuits until the voltage divider resistors fail open to restore the trip function in the unlikely event that a -125 volt hot short were to occur. Computer failures will not compromise the safety-related inputs because these inputs are isolated by "flying capacitors."

We have not received a response to Reference (6) from the NRC.

V. Conclusions

In summary, our evaluation has concluded that:

- o The probability of hot shorts of ± 125 VDC or 120 VAC is extremely remote.
- o Attempts to provide further isolation could potentially be counterproductive since wiring changes would greatly increase system complexity, and the greater number of connections and termination could increase the potential for hot shorts, and
- o From a risk perspective, failure of the reactor protection system is dominated by common mode mechanical failures. Electrical failures due to inadequate isolation do not contribute significantly to the overall RPS failure probability.

Based on the above, NNECO concludes that the current design is adequate, further isolation is not necessary and this topic is considered resolved.

VI. References

1. D. M. Crutchfield letter to W. G. Counsil, dated July 23, 1981.

2. D. M. Crutchfield letter to W. G. Council, dated February 1, 1982.
3. NUREG-0824, Integrated Plant Safety Assessment Report, Millstone Nuclear Power Station, Unit No. 1, Section 4.25.
4. W. G. Council letter to D. M. Crutchfield, dated July 8, 1982.
5. J. J. Shea letter to W. G. Council, dated July 25, 1982.
6. W. G. Council letter to D. M. Crutchfield, dated January 31, 1984.