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 • Selden Street, Berlin, Connecticut

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

October 24, 1985

Docket No. 50-245
B11828

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:

- ISAP Topic 1.12 - "Control Room Habitability"

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

C. F. Sears

By: C. F. Sears
Vice President

cc: J. A. Zwolinski

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Docket No. 50-245

ISAP TOPIC NO. 1.12

CONTROL ROOM HABITABILITY

October, 1985

ISAP Topic No. 1.12
Control Room Habitability

I. Introduction

Certain accidents create the potential for impairing control room operator actions, or exposing operators to radiation doses in excess of the General Design Criterion (GDC) 19 limits. NUREG-0737 Item III.D.3.4, Control Room Habitability Requirements, was issued to assure that licensees adequately protected control room operators against the effects of an accidental release of toxic or radioactive gases and that nuclear power plants can be safely shutdown under design basis accident conditions. The purpose of this topic is to reevaluate NUREG-0737 Item III.D.3.4 and establish a new implementation schedule that reflects its safety significance.

II. Criteria

1. NUREG-0737 Item III.D.3.4
2. 10CFR50 Appendix A Criterion 19
3. Standard Review Plan, Chapter 15.6.5, Appendices A and B

III. Related Topics/Interfaces

ISAP Topic 2.07, Sodium Hypochlorite System

IV. Evaluation

In Reference (1), NNECO provided a discussion of the radiological dose analyses performed in response to Item III.D.3.4 of NUREG-0737. This submittal also provided a preliminary schematic of proposed modifications which were determined to be necessary in order to meet the NUREG-0737 criteria. Northeast Nuclear Energy Company (NNECO) requested deferral of modifications associated with NUREG-0737 Item III.D.3.4 in Reference (2) in order to conduct an integrated review. The purpose of the integrated review was to reassess the safety significance of planned modifications and establish long-term implementation schedules. In References (3) and (5), the NRC Staff concluded that deferral of the control room habitability modifications was justified and acceptable.

The proposed modifications would provide:

- o Automatic isolation of the control room ventilation system upon detection of high radiation or chlorine gas level,
- o 100% recirculated air (3,000 cfm is filtered) during a radiation or chlorine gas release and
- o A post-accident purge to reduce the CO_2/radiation content of the control room.

The following is a discussion of the dose analyses performed to determine the radiological impact of a DBA at either Millstone Unit 1, 2 or 3 on the Unit 1 control room.

Millstone Unit 1 Accident

The design basis LOCA at Millstone 1 has two release points. The first occurs when activity from containment leaks into the reactor building and is processed by the Standby Gas Treatment System before being released to the environment via the Unit 1 stack. The second release point occurs when MSIV seat leakage collects in the condenser and associated piping before being released into the turbine building through leaks in the condenser. This leakage eventually passes from the turbine building and into the environment.

The release from the Unit 1 stack has little effect on control room doses mainly because very little activity would accumulate near the control room intake due to the distance from the release point and the height of the stack. A release from the stack, therefore, has virtually no effect on the control room dose. MSIV leakage is a ground level release from the turbine building. This, coupled with the fact that the turbine building is very close to the Unit 1 control room intake vents, results in control room thyroid doses which exceed the acceptance criterion. Calculations show that if the turbine building ventilation system can be used to draw the condenser leakage up the stack within four hours after LOCA, then no modifications would have to be made to the control room. The turbine building ventilation system could be activated at a later time if bottled air were used to pressurize the control room. Thus, few if any modifications would have to be made based on an Millstone 1 accident.

Millstone Unit 2 Accident

The design basis accident at Millstone Unit 2 considered two different meteorology conditions in existence at the time of the LOCA. Case 1 assumed low wind speeds (high X/Q) and Case 2 considered high wind speeds (low X/Q). The effect on activity released from these meteorology conditions and the consequences from each case are discussed below.

a) Case 1

This case assumes low wind speeds are prevalent which maximizes the atmospheric dispersion coefficient and, hence, the doses.

The general scenario is that activity in the containment, as a result of the LOCA, would leak into the Enclosure Building and be processed by the Enclosure Building Filtration System (EBFS) before being released to the environment by the Unit 1 stack. Until the Enclosure Building draws negative pressure (approximately 110 seconds), all containment leakage is assumed to bypass the Enclosure Building and be released untreated at ground level. Thereafter, a small fraction of the containment leakage (4.025×10^{-7}) bypasses the EBFS and is released at ground level. This bypass leakage, however, is so small that it has a negligible effect on the dose. The majority of the dose is caused by the initial 110 second ground level release.

b) Case 2

This case was formulated from NRC Question 6.16.1 of the Millstone Unit 2 FSAR. Basically, high wind speeds are postulated to cause 10 percent of the activity in the Unit 2 Enclosure Building to exfiltrate. This ground level release is assumed to occur for 36 consecutive hours even though this is highly unlikely to occur. A review of recent meteorology data at the site confirms that wind speeds of 30 mph or over will occur in the direction of the control room for about 5 percent of the time (36 hours = 5 percent of 720 hours). It does not, however, specify that the 36 hours will occur consecutively. For analysis purposes, the 36 hours were considered to occur consecutively. This is very conservative since the concentration of activity outside the control room would be near zero when wind speeds are less than 23 mph (no exfiltration occurs for wind speeds less than 23 mph) and, therefore, the control room could be purged of activity during these periods.

As previously stated, the release from the Unit 1 stack has little effect on control room dose. The ground level release from the Unit 2 enclosure building, however, has a significant impact on the control room dose. Computer analyses indicate that the Unit 1 control room thyroid dose from a Millstone Unit 2 DBA would be over the NRC limit of 30 rems, even if purging the control room is performed 36 hours after the initiation of the accident. The large quantity of bottled air which would be required to pressurize the control room rules out pressurization as being a viable alternative. A filtration system would therefore be required in order to protect the MP1 control room from a Unit 2 accident.

Millstone Unit 3 Accident

The Unit 3 design basis accident as described in the FSAR considers several release points. The containment leakage lasts for a period of one hour, and most of it is exhausted via the auxiliary building ventilation system's HEPA and charcoal filtration system and discharged to the environment at ground level. A fraction of the containment leakage bypasses the supplementary leak collection system and is released untreated at ground level. Also, for the initial minute after the accident, the containment leakage is assumed to be a ground level release. In addition to containment leakage, there is leakage from the Engineered Safety Feature (ESF) system which lasts from 220 seconds to 720 hours. This leakage occurs in the auxiliary building and is treated by the HEPA and charcoal filtration systems before being released at ground level to the environment.

Calculations of the impact of this accident on the Unit 1 control room indicate that thyroid doses would be over NRC guidelines. Therefore, a DBA at Millstone 3 would require use of a filtration system in the Millstone 1 control room.

Summary of Results

In each case analyzed, the predicted doses were within the acceptance criteria of NUREG-0737 Item III.D.3.4 for both whole body and skin (beta)

dose. However, with the existing ventilation system design, thyroid doses were calculated to exceed the 30 rem criterion, and the modifications described above were proposed.

As detailed in Reference (4) the total benefit of the proposed HVAC upgrade is estimated as 45 man-rems for the cases of chlorine gas release and radiation release. As indicated in Reference (4) the frequency of postulated core melt accidents initiated by a chlorine release is 9.2×10^{-7}/year. The frequency of postulated core melt accidents at Unit No. 1 initiated by a high radiation level due to a release from Unit No. 2 is estimated to be 2.5×10^{-7}/year. Installation of the proposed HVAC modifications is a large expense for a relatively small benefit. Additionally, the benefit would be further reduced if chlorine were not stored on site. We note that ISAP Topic 2.07, Sodium Hypochlorite System, includes evaluation of this option.

V. Conclusions

An alternate method of protecting the control room operators should be explored because of the very high cost of control room HVAC design modifications. Dose assessments have shown that control room operators only need additional radiation protection from thyroid doses. Additionally, any reductions in the radioactive source term, as are being evaluated by the NRC Staff, would result in lower thyroid doses. As an alternative, self-contained breathing apparatus could protect control room operators from airborne iodine and chlorine gas and provide approximately the same benefit as the HVAC modifications at a significantly lower cost. Based on these considerations NNECO proposes that alternatives to the proposed modifications be evaluated further to determine the appropriate scope of modifications. Also, the results of ISAP Topic 2.07 will need to be addressed.

VI. References

1. W. G. Counsil letter to D. G. Eisenhut, dated July 1, 1981.
2. W. G. Counsil letter to D. G. Eisenhut, dated December 28, 1983.
3. D. G. Eisenhut letter to W. G. Counsil, dated April 5, 1984.
4. J. F. Opeka letter to C. I. Grimes, dated September 6, 1985.
5. J. A. Zwolinski letter to J. F. Opeka, dated July 1, 1985.