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

November 22, 1985

Docket No. 50-423
B11899

Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

References: (1) H. L. Thompson, Director of Licensing, memo to E. L. Jordan, Director, Division of Emergency Preparedness and Engineering Response, Office of I&E, dated July 15, 1985.

(2) J. O. Cermak of the WOG letter to D. L. Wigginton of U.S. NRC, dated October 28, 1985.

Dear Mr. Youngblood:

Millstone Nuclear Power Station, Unit No. 3
Evaluation of Effects of Superheated Steam Blowdowns
on Equipment Outside of Containment

In June 1984, all Westinghouse utilities were notified of a potential unreviewed safety question concerning the impact on the environmental qualification (EQ) of equipment outside of the containment. The mass/energy releases following a postulated steamline rupture are used to determine the temperature profiles for qualification of equipment. The temperature profile created is a function of both the steam blowdown and the compartment in which the equipment is located. If the generation of superheated steam is included in the mass/energy releases, the enthalpy of the steam will be higher. This in some cases may cause higher temperatures in the compartment.

Northeast Nuclear Energy Company (NNECO) is a member of the Westinghouse Owners Group (WOG) High Energy Line Break (HELB)/Superheated Blowdowns Outside Containment (SBOC) Subgroup. This subgroup has been formed to address the impact of superheated steam blowdowns from high energy line breaks (e.g., main steam line breaks) outside containment on the environmental qualification of the equipment located in the vicinity of the break. The program will provide generic mass/energy release to evaluate the impact of superheated steam on equipment in the vicinity. With generic blowdowns available, the EQ evaluations can be done by each utility to reflect the plant-specific environment conditions. The program will address the full range of required break sizes.

A048
1/1

The WOG HELB/SBOC Subgroups and Westinghouse Representatives met with the NRC in Bethesda, Maryland, on January 30, 1985 to discuss the program to resolve the HELB/SBOC licensing issues. At that meeting, the WOG representatives described the program which would provide formal documentation for mass and energy releases to each of the participating utilities. During discussion following the subgroup presentation, the NRC stated they would consider changing the existing SER open item to a confirmatory item for NTOLs based on a commitment by the applicant to resolve the issue as a part of the WOG HELB/SBOC Subgroup.

In Reference 2 the WOG informed the NRC of the completion of the program. A final report detailing the results of the program was issued to each participating utility member on October 21, 1985. Implementation Suggestions (Guidelines) which are necessary to perform plant specific equipment EQ evaluations were issued to each participating utility member on November 1, 1985.

NNECO has established a schedule to complete the plant-specific review. The revised compartment analysis using the mass and energy release data provided by the WOG program will be completed by the end of January 1986. This analysis will redefine if necessary the temperature profiles in affected compartments outside containment. A qualified equipment review will then be conducted to assess any changes in qualification status. This evaluation is scheduled to be completed by the end of March 1986. Subsequent corrective action, if necessary, will be identified and completed by NNECO by the end of April 1986.

In Reference 1, the Staff concluded that the WOG program and justification for continued operation pending identification of equipment qualification concerns, if any, has been reviewed and found acceptable by the Staff for those utilities referencing the program. This conclusion applies to both operating reactors and NTOL plants. We do not know of any equipment that is not qualified at this time.

The attached evaluation in combination with the low probability of the catastrophic high energy line break event itself, provide assurance that Millstone Unit No. 3 can be operated safely at all power levels pending resolution of this issue.

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

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY
et. al
BY NORTHEAST NUCLEAR ENERGY COMPANY
Their Agent

J. F. Opeka
Senior Vice President

By: C. F. Sears
Vice President

STATE OF CONNECTICUT)
) ss. Berlin
COUNTY OF HARTFORD)

Then personally appeared before me C. F. Sears, who being duly sworn, did state that he is Vice President of Northeast Nuclear Energy Company, an Applicant herein, that he is authorized to execute and file the foregoing information in the name and on behalf of the Applicants herein and that the statements contained in said information are true and correct to the best of his knowledge and belief.

Sheila M. Oates
Notary Public

My Commission Expires March 31, 1986

Attachment I

Evaluation of Effects of Superheated Steam Blowdown
on Equipment Outside of Containment

In July 1984, all Westinghouse utilities were notified of a potential main steam line failure scenario which could result in uncovering the steam generator tube bundle and the production of superheated steam. Release of this steam could result in higher temperatures in the main steam valve building than have been used in the Millstone Unit No. 3 Equipment Qualification Program. The potential effects of this increased temperature on equipment required to safely shutdown the plant and maintain it in a safe shutdown condition have been evaluated qualitatively. These results are summarized below.

a. Main Steam piping in the main steam valve building from the containment penetration to the point where the piping exits the cubicles containing safety-related equipment required to mitigate the effects of a MSLB is designed with stress values below those required to establish break exclusion boundaries. Therefore, breaks in this main steam piping are not considered credible.

b. Each steam line contains a main steam line isolation valve (MSIV) which is designed to terminate the blowdown in the event of a steam line break. The MSIVs are located outside and within a short distance of the containment penetration of the main steam lines. Thus, the steam generator blowdown from any outside containment break occurring downstream of the MSIV will be terminated once steam line isolation occurs. The blowdown will only continue if the break cannot be isolated, i.e., the MSIVs fail to close or the break is between the containment penetration and the MSIV. A single failure of the safety grade MSIV is highly unlikely. As stated in (a) above a break between the containment and the MSIV is not considered credible.

c. The timing of tube bundle uncovery and the resultant superheated steam release relative to the performance of required safety injections is important in determining the impact of a main steam line break outside the containment. Safety-related components generally will not fail in an adverse way after completing their safety function.

The WOG Report, WCAP-10961, includes results which show for Millstone Unit No. 3, which is included under Category I plants, all but one (1) necessary safety function is performed well before steam generator tube bundle uncovery for every case considered. These functions are:

- Reactor Trip
- Feedwater Isolation
- Safety Inspection Actuation
- Auxiliary Feedwater Actuation

Steamline Isolation, which is actuated by a low steam line pressure signal, is shown to occur subsequent to uncovery.

The WOG Report also notes that the low steam line pressure setpoint can have a large effect on the steam line break mass and energy release rates. The setpoint value used for the analyses was chosen as the minimum for all Category I plants. Sensitivity analyses were performed for this parameter, and the results shown in WCAP-10961, Figure III.B-1 as the minimum steam pressure required for steam line isolation to occur before tube bundle uncovery. The Millstone Unit No. 3 trip setpoint for Low Steam Pressure is 648.6 psia, and the minimum allowable value is 644.9 psia. This setpoint is well above the minimum pressure value for all break sizes shown on Figure III.B-1. Smaller break sizes are not a concern, as the mass and energy release data for Millstone Unit No. 3 do not indicate any superheat. Therefore it can be concluded that the steam line isolation will occur prior to tube bundle uncovery for all cases of concern.

For a steam line break downstream of the main steam isolation valve (MSIV), steam line isolation will terminate break flow and preclude superheat releases. Equipment will not be exposed to conditions beyond the current EQ Program conditions.

For a steam line break between the containment penetration and the MSIV, tube bundle uncovery and superheat releases will occur subsequent to steam line isolation and all other necessary safety functions. The only action required after uncovery is operation of the main steam safety valves, which are not expected to be affected by the superheated releases.

Manual isolation of auxiliary feedwater flow to the affected steam generator will terminate all break flow and allow subsequent actions necessary to provide controlled cooldown to a safe shutdown condition.

At lower power ($\leq$ 5%), the steam generator has a higher mass inventory which will delay bundle uncovery. The amount of stored energy and decay heat, as well as feedwater temperature are less for lower power levels. This will result in lower primary temperatures and less primary to secondary heat transfer during the steam line break event. Overall, the steam line break event initiated from lower power level results in lower levels of steam superheating than analyses initiated from full power.

d. To provide some further insight into the relative risk perspective of this issue, it is noted that although the main steam line break (MSLB) accident is an important design basis accident in determining several design features of the plant, the accident sequences associated with MSLB generally are not regarded as major contributors to public risk. A MSLB will not uncover the reactor core. As long as either main or auxiliary feedwater is available, core cooling is achievable. For the particular concern with superheated conditions causing equipment failure, the equipment which fails must in turn cause failure of auxiliary feedwater and main feedwater to all steam generators in order to present any public health and safety concerns. The events thus form a sequence of probabilities which, when considered with other decay heat removal strategies, further supports our conclusions that the actions underway to evaluate temperature profiles outside of containments as a result of superheat are adequate and plant operation at full power may continue pending this evaluation.

e. The current basis for defining the environment for qualification assumes that the equipment is at the same temperature as the environment. Although the surface temperature of the equipment may indeed match the environment, the active parts of the equipment (thermocouples, actuators, etc.) are generally insulated from the atmosphere. Thus, there will be a thermal delay before the active part of the equipment reaches a temperature that would exceed the envelope of qualification and/or cause it to fail.

Conclusion:

The above evaluation in combination with low probability of the catastrophic high energy line break event itself, provide assurance that Millstone Unit No. 3 can be operated safely at full power pending resolution of this issue.