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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June 28, 1984

Docket No. 50-423
B11253

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

Dear Mr. Youngblood:

Millstone Nuclear Power Station, Unit 3
Revised Response to
Mechanical Engineering Branch Question 210.31

Attached is Northeast Nuclear Energy Company's (NNECO) revised response to Mechanical Engineering Branch (MEB) Question 210.31 concerning piping vibration levels. The response to Q210.31 has been modified several times as a result of meetings and telephone discussions with the Staff on the subject of piping vibration level acceptance criteria. This most recent revision comes as a result of a June 26, 1984 telephone conversation between members of the NRC Staff and representatives of NNECO.

We believe this additional information will fully resolve the Staff's concerns regarding Q210.31. 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

W. G. Counsil
Senior Vice President

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

Then personally appeared before me W. G. Counsil, who being duly sworn, did state that he is Senior 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.

Lorraine J. D'Amico
Notary Public

My Commission Expires March 31, 1988

Question No. Q210.31 (Section 3.9.2)

Provide the acceptance criteria that will be used to determine if the vibration levels observed or measured during the preoperational testing are acceptable. Specifically address how the vibration amplitudes will be related to a stress level and what stress levels will be used for both steady-state and transient vibration.

Response:

Vibration levels are observed or measured during preoperational testing for both steady state and transient vibration conditions. The programs used to monitor these conditions are described below.

Steady State Vibrations

Visual observations are used for judging acceptability of steady state vibration. Visual observations may be aided by hand-held instruments (e.g., vibrometers) when considered appropriate by engineers qualified to judge vibration to the requirements of ASME Section XI, 1980.

A screening velocity or displacement will be established. If the measurement indicates that the velocity or displacement limit is exceeded, the measured values are reconciled with the respective analyses by considering the specific piping configuration, velocity or displacement amplitude measured, stress indices, and the endurance strength of the material properly accounting for the impact of high cycle effects. If system modifications are required, the applicable ASME design calculations are reconciled to assure acceptable system characteristics for all applicable design conditions.

The maximum alternating stress intensity (S_{alt}) will be used to establish the acceptance stress criteria for steady state vibrations.

For ASME Class 1 piping:

$$S_{alt} = C_2 K_2 \frac{M}{Z} \leq \alpha \ S_{el}$$

where: α = 0.615 for materials covered by Figure I-9.1 of ASME III
α = 0.6 for materials covered by Figure I-9.2.1 of ASME III
α = 1.0 for materials covered by Figure I-9.2.2 of ASME III

C_2 = Secondary stress index defined in the ASME Code

K_2 = Local stress index defined in the ASME Code

M = Maximum zero to peak dynamic moment loading due to vibration displacement

Z = Section modulus of pipe

S_{el} = Alternating stress at 10^6 cycles from Figure I-9.1 or I-9.2.1 of ASME Section III or alternating stress at 10^{11} cycles* from Figure I-9.2.2 of ASME Section III.

For ASME Classes 2 and 3 piping, and for ANSI B31.1 piping the above equation is applicable, setting:

$$C_2 K_2 = 2i$$

where:

i = Stress intensification factor, as defined in the ASME Code, Subsection NC, ND; or B31.1.

Transient Vibrations

Transient vibration conditions are subjected to visual and instrumented observations as described in the response to NRC Question 210.30. When instrumented observations are taken, the acceptance criteria are based on the applicable fluid system transient analysis (stress, deflection, etc) results. Instrumented observations are considered acceptable if they are within the transient analysis results acceptance criteria. If instrumented results exceed the acceptance criteria, the results are reconciled with the design analysis including the appropriate code allowable. When system modifications are required to achieve acceptable levels of transient vibration, the ASME design calculations are reviewed and modified as necessary to assure acceptable system characteristics.

*An appropriate number of cycles less than 10^{11} may be specified by Engineering based on system operation and actual system response data. The appropriate curve (A, B or C) will be used for Figure I-9.2.2 in accordance with ASME III definitions.