NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
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October 15, 1985

Docket No. 50-423
B11811

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

References:

(1) J. F. Opeka letter to B. J. Youngblood, "Seismic Interaction Program," dated August 8, 1985.

(2) B. J. Youngblood letter to J. F. Opeka, "Request for Additional Information," dated September 17, 1985.

(3) J. F. Opeka letter to B. J. Youngblood, "Seismic Interaction Program," dated September 27, 1985.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 3
Seismic Interaction Program

In Reference (1), Northeast Nuclear Energy Company (NNECO) provided the Staff information regarding the seismic interaction program for Millstone Unit No. 3. In Reference (2), the Staff requested additional information regarding the utilization of historical earthquake data in the evaluation of non-seismic Category 1 piping systems. In a subsequent telecon concerning Reference (2) the Staff specifically requested that NNECO demonstrate quantitatively that the database of historical earthquake information is directly applicable to the seismic interaction program.

In Reference (3), NNECO further defined the seismic interaction program for Millstone Unit No. 3 and therein committed to provide additional information supporting this use of the historical database.

Representatives from NNECO met with the Staff on October 9, 1985 to discuss the Staff's concerns regarding the seismic interaction program submittals (References 1 and 3).

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It is now our understanding that the only information needed for the Staff to accept our program regarding the seismic interaction issue is:

- o Demonstrate that the database is representative of Millstone Unit No. 3.
- o Demonstrate by analysis that the load demand on equipment anchorages does not exceed the anchorage capacity. This may be demonstrated by analysis of representative anchorages judged to be bounding.

The similarity between the database equipment and Millstone Unit No. 3 equipment has been established through comparison of critical parameters as identified in Reference (3). Attachment I provides a detailed breakdown of these parameters for Millstone Unit No. 3 and the corresponding database information. This information demonstrates that equipment at Millstone Unit No. 3 is similar to and at least as durable as equipment in the database. The use of database information to predict and evaluate seismic interactions at Millstone Unit No. 3 is justified.

The issue of equipment anchorage will be addressed in two categories; piping anchorage and equipment anchorage. Equipment anchorage to be reviewed, will include mechanical equipment such as pumps, tanks, heat exchangers; electrical equipment such as panels, heaters, MCC's; and miscellaneous equipment such as lighting fixtures, doors, fire extinguishers etc. All such equipment which has the potential to interact with seismic Category I equipment will be identified and grouped according to type of equipment and anchorage type. This equipment will be compared against the list of equipment (non-seismic Category I) known to have been supported seismically. For the remaining equipment (non-seismic Category I) a sufficient number of bounding anchorages will be analyzed to show adequacy. The manner in which each interaction is dispositioned will be documented.

Piping anchorage will be addressed through a program developed and implemented by Sargent and Lundy at other Near Term Operating License applicant (NTOL) plants. Through the walkdown program described in Reference (3), potential interactions between non-seismic Category I piping and seismic Category I piping or equipment will be identified. Several typical piping systems will be evaluated using bounding input motions. The systems will be selected to be representative of pipe sizes with a good distribution of typical support configurations and will contain both hot and cold piping. The following is a discussion of this program.

Protection against support failure, and overall collapse is provided by the design procedure in the ASME Boiler and Pressure Vessel Code, Section III or in the ANSI B31.1 code. The design of non-safety related piping and its supporting hardware contains a sufficient margin of safety to sustain the additional dynamic loads due to earthquake motion. To substantiate this statement, an assessment will be made of selected representative piping subsystems. Each of these selected subsystems will be analyzed for the combined loadings of weight, thermal expansion, and safe shutdown earthquake. The response spectrum

method of analysis will be used. Realistic damping of not less than 5% of critical will be utilized in the subsystem analysis. Time history analysis will be run on a limited basis to validate assumptions made in the response spectrum analysis, namely that one way supports (rod hangers, sliding supports) do not experience significant uplift.

Restraint loads and pipe stresses will be calculated using dynamic analysis results. They will be compared to the failure capacities associated with each subsystem to assess the inherent margin of safety in the design. Maximum dynamic lateral displacements of the subsystems will also be computed. These displacements will be used to confirm interactions identified during plant walkdowns.

The walkdown program as detailed in Reference (3) identifies potential interferences and also determines if additional supports or corrective actions are needed to alleviate problem interactions.

A stress analysis of the selected subsystems will be performed using ASME Boiler and Pressure Vessel Code, Section III, Subsection NC and Appendix F. Satisfaction of the criteria guarantees that the piping will remain intact. The factor of safety against pipe failure is calculated for each joint of the subsystem by the following formula.

$$F.S. = \frac{2.4 \times S_h}{\text{Stress calculated by Eq. 9, NC-3650}}$$

where S_h is the basic material allowable stress at maximum operating temperature from allowable stress tables.

In cases where the factor of safety as calculated by this equation is less than 1.0, damping may be increased to account for local yielding in the piping. Collapse mechanisms of the piping and load redistribution patterns will also be investigated for these cases if they exist.

A review will be made of the suspension system hardware and the structural steel supports of the selected subsystems.

The component support hardware will be reviewed for a combination of weight, thermal expansion and safe shutdown earthquake. A failure capacity of the standard component support hardware subjected to tension is taken to be the normal capacity rated by the manufacturers with a factor of safety of 1.0. For the type of support subjected to compression, such as stanchion, or to bending such as trapeze, the rated faulted load (Level D) will be used. The factor of safety of each standard component support hardware is calculated using the following formula:

$$F.S. = \frac{\text{Failure Capacity of the Weakest Link of Suspension System}}{\text{Calculated Combined Load}}$$

For supports which do not have a factor of safety of 1.0, an evaluation will be performed to determine the consequences. This will address the redistribution of load to adjacent supports as well as the anchorage of the failed support.

It is our intention to use the database information to identify potential interactions and to establish their severity. Further, it should be noted that calculations required to demonstrate support integrity for equipment outside the scope of the Sargent and Lundy work will make use of the above criteria as applicable to support stresses and anchorage evaluations.

If cases are found during this program which could cause overall collapse of the subsystem or which results in unacceptable large lateral deflections, corrective action will be taken on a support specific or generic basis as appropriate.

NNECO is confident that the information and commitment to perform the above described analyses will allow the NRC Staff to accept our program regarding the seismic interaction issue. To the extent that the Staff needs additional information on this issue, NNECO respectfully requests a meeting with appropriate NRR management to resolve this issue.

Very truly yours,

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

J. F. Opeka
J. F. Opeka
Senior Vice President

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

Then personally appeared before me J. F. Opeka, 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