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July 7, 1994

Docket No. 50-336 B14892

U.S. Nuclear Regulatory Commission Attention: Document Control Desk Washington, DC 20555

Millstone Nuclear Power Station, Unit No. 2 Generic Letter 87-02, Supplement 1, USI A-46

Purpose

The purpose of this letter is to provide calculations for NRC Staff review and approval. These calculations document the technical justification of the approach for developing realistic, median centered in-structure response spectra for the Millstone Unit No. 2 Auxiliary Building.

The generated spectra are strictly intended for use in the Unresolved Safety Issue (USI) A-46 project only. This does not introduce any change to the current plant licensing basis, nor does it represent a reduction in commitments or design margins.

Background

In a letter dated February 19, 1987,⁽¹⁾ the NRC Staff issue i Generic Letter 87-02, "Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors, Unresolved Safety Issue (USI) A-46," to implement the resolution of USI A-46 which coocluded that the seismic adequacy of certain equipment in operating nuclear power plants should be reviewed against seismic criteria not in use when these plants were licensed.

(1) H. R. Denton letter to All Holders of Operating Licenses Not Reviewed to Current Licensing Criteria on Seismic Qualification of Equipment, "Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors, Unresolved Safety Issue (USI) A-46 (Generic Letter 87-02)," dated February 19, 1987.

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The seismic qualification utility group (SQUG), representing its member utilities, committed to develop a Generic Implementation Procedure (GIP) for use by its members. SQUG completed the final version of the GIP, Revision 2 (GIP-2) and submitted it to the NRC Staff for review and approval on February 14, 1992.⁽²⁾

The NRC Staff issued a Supplemental Safety Evaluation Report for GIP-2 on May 22, 1992.⁽³⁾ Northeast Nuclear Energy Company (NNECO) provided a response to the NRC Staff in a letter dated September 21, 1992.⁽⁴⁾

Discussion

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During the implementation of the GIP-2 methodology at Millstone Unit No. 2, it was noted that the exterior embedded walls of the Auxiliary Building were covered by a 1/2 inch fiberboard (Homasote) which isolated the structure from the surrounding backfill soil. Given this configuration, the effective grade for the building was defined at elevation -25 feet 6 inches. Consequently, most equipment located above grade level (top of soil at elevation 14 feet) will not benefit from the use of the GIP-2 40 foot rule.

On March 10, 1994, NNECO contacted the NRC Staff to request a meeting for discussing this condition and for presenting a proposed resolution. A presentation was made to the NRC Staff on

- (2) "Generic Implementation Procedure (GIP-2) for Seismic Verification of Nuclear Plant Equipment," Revision 2, corrected February 14, 1992, Seismic Qualification Utility Group, February 1992.
- (3) J. G. Partlow letter to All Unresolved Safety Issue (USI) A-46 Plant Licensees Who Are Members of the Seismic Qualification Utility Group (SQUG), "Supplement No. 1 to Generic Letter (GL) 87-02 That Transmits Supplemental Safety Evaluation Report No. 2 (SSER No. 2) on SQUG Generic Implementation Procedure, Revision 2, as Corrected on February 14, 1992 (GIP-2-2)," dated May 22, 1992.
- (4) J. F. Opeka letter to the U.S. Nuclear Regulatory Commission, "Haddam Neck Plant, Millstone Nuclear Power Station Unit Nos. 1 and 2, Plant Specific Response to Supplement 1 of Generic Letter 87-02," dated September 21, 1992.

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March 18, 1994.⁽⁵⁾ During this meeting NNECO outlined the proposed approach for generation of realistic median centered spectra for the Auxiliary Building, and indicated that these calculations will be completed by June 1994, and submitted to the NRC Staff. During a telephone conference with NRC Staff on June 29, 1994, it was agreed that this letter would be submitted on July 7, 1994.

NNECO is submitting, as Attachment 1 to this letter, two calculations which document the criteria selected as well as its implementation, for NRC Staff formal review and approval. Calculation MOT-01 summarizes the methodology and criteria that was presented during our March 18 meeting. Calculation A46-1 documents the generation of the realistic median centered spectra.

The generated spectra are strictly intended for use in the A-46 project only. This does not introduce any change to the current plant licensing basis, nor does it represent a reduction in commitments or design margins.

The methods used comply with the guidelines given in Section 4.2.4 of the SQUG GIP-2. Specifically, the GIP-2 states that realistic, median-centered in-structure response spectra may be compared to 1.5 times the bounding spectrum as a valid comparison of seismic capacity to seismic demand for USI A-46 equipment evaluations.

The Auxiliary Building model was developed using the existing design basis analysis and the structural drawings. The properties were reviewed and eccentricities between centers of mass and centers of rigidity at each major elevation were addressed.

The A-46 spectra were generated using a suite of earthquake time history inputs to the structural model, while randomly varying key properties of the model. The use of a suite of time histories and variation of structural properties incorporates, in a statistically correct manner, the variability inherent in the input motion as well as the modeling of the structure.

The suite of 30 earthquake time histories were selected from scaled historical earthquakes and artificially generated motions.

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⁽⁵⁾ G. S. Vissing Letter to Northeast Nuclear Energy Company, "Summary of Fublic Meeting of March 18, 1994, with Representatives of Northeast Utilities to Discuss a Proposed Seismic Response Spectra for Use in A-46 Evaluations for Millstone Unit No. 2 (TAC No. M69459)" dated March 31, 1994.

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The median (50 percentile) response spectrum at five percent damping was generated from the individual time histories and compared to the target ground response spectrum, which corresponds to the design basis ground motion. This motion was directly inputted into the base of the Auxiliary Building. The analyses are for a fixed base and no soil structure interaction effects are considered.

This ground motion was shown to result in a surface motion (top of soil) that envelopes the GIP-2 recommended NUREG/CR-0098 (84 percentile) shape, anchored to the safe shutdown earthquake peak ground acceleration of 0.17 g, in the frequency range of interest (5 to 10 Hz). In addition, the ground motion was also shown to be as conservative as the average of 69 eastern U.S. sites.

Variation in the structural response, due to variation in structural damping and frequency, were included in the following manner. The earthquake time histories were assumed to be equally likely so that the sample size for the simulation was set equal to 30. Damping ratios and structural frequencies were assumed to be random variables that were log normally distributed with the medians and log normal standard deviations. The median value of damping selected was 7 percent, consistent with Regulatory Guide 1.61. Each earthquake time history was assigned to a randomly selected damping and frequency ratio. For each time history analysis, the modal frequency was scaled by the frequency ratio and the modal damping assigned, according to the values selected. A mode superposition time history analysis was then performed for each of the earthquake time histories and associated model parameters.

In-structure response spectra, at five percent damping, were generated for each response time history at each model response point and for the two horizontal and vertical directions. The 30 response spectra were combined and the median response spectra for each location and direction were calculated.

Conclusion

The analysis approach is consistent with the recommendations of the Standard Review Plan (SRP). As such, in accordance with the GIP-2 terminology, the resulting spectra may be considered U.S. Nuclear Regulatory Commission B14892/Page 5 July 7, 1994

conservative design spectra. However, NNECO has not confirmed that the ground motion meets the requirements of Section 2.5 of the SRP. Therefore, the generated spectra will be treated as median contered and their use restricted to A-46.

If you have any questions regarding this information, please contact Mr. G. Papanic at (203) 665-6218.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

J. F. Opeka

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Executive Vice President

cc: T. T. Martin, Region I Administrator

G. S. Vissing, NRC Project Manager, Millstone Unit No. 2

P. D. Swetland, Senior Resident Inspector, Millstone Unit Nos. 1, 2, and 3

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Attachment 1

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