

YANKEE ATOMIC ELECTRIC COMPANY

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WYR 79-146



20 Turnpike Road Westborough, Massachusetts 01581

November 29, 1979

United States Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Office of Nuclear Reactor Regulation
Mr. Dennis L. Ziemann, Chief
Operating Reactors Branch #2
Division of Operating Reactors

Reference: (a) License No. DPR-3 (Docket No. 50-29)

Dear Sir:

Subject: Yankee Rowe SEP; Site Dependent Response Spectra

Enclosed as Figure 1 is the horizontal seismic response spectra for the Yankee Rowe Nuclear Power plant site.

The response spectra for the Yankee Rowe site were developed using only earthquakes determined to appropriately fulfill the prescribed earthquake ground motion potential at a site; namely, the magnitude of the SSE, the hypocentral distance, and the site foundation conditions. This approach, which is in accordance with the criteria of Appendix A, avoids many of the problems inherent with determining ground motion by scaling event size or epicentral distances. From recent seismological studies, it is known that the shape of the spectral excitation is dependent on earthquake size as well as frequency-dependent attenuation effects. The proper selection of accelerograms which are used to construct the response spectra void the errors resulting from scaling.

The seismicity evaluation for Yankee Rowe as prepared by Weston Geophysical was submitted to the NRC on February 23, 1979. This report entitled "Geology and Seismology, Yankee Rowe Nuclear Power Plant" considered the seismicity within the site tectonic province as well as adjacent tectonic provinces and structures to reach the conclusion "that an Intensity VI(MM) is an appropriately conservative estimate of the Safe Shutdown Earthquake". The Safe Shutdown Earthquake is best characterized by a magnitude of 4.5 in the report entitled "Eastern United States tectonic Structures and Provinces Significant to the Selection of a Safe Shutdown Earthquake" prepared by Weston Geophysical for the SEP Owner's Group and submitted to the NRC on October 16, 1979.

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The occurrence of a larger earthquake at a greater epicentral distance was also considered in the seismicity evaluation of the Rowe site. A magnitude range of 5.5 to 6.0 for an Intensity VIII(MM) earthquake associated with the Ossipee and Cape Ann plutons of the White Mountains Intrusive Series and a magnitude range of 5.0 to 5.5 for an Intensity VII(MM) earthquake associated with the Adirondack Uplift constitute the maximum risk to the Rowe site from a distant event.

Geological investigations of the site locale show that the Rowe plant is situated on glacial sediments in the lower elevation of a broad bedrock valley with the bedrock surface beneath the site dipping at 30° to 50° to the southeast. Seismic refraction surveys and test borings have identified the glacial deposits as dense till. In-situ velocity measurements (report transmitted to the NRC on April 5, 1979) have determined that the 70 to 140 feet of glacial till beneath the site has a compressional wave velocity of 6,700 to 7,000 ft/sec and a shear wave velocity of 1,700 to 2,200 ft/sec.

Using the seismicity and site conditions defined above, our strong motion data base was searched for accelerograms produced by earthquakes within the appropriate magnitude and epicentral distance ranges and recorded at sites whose geologic setting and/or foundation conditions (based on shear wave velocity data if available) resemble those at Rowe. The selected accelerograms were corrected for instrument response in accordance with state-of-the-art procedures to obtain response spectra for each available component.

The selected data for the magnitude 4.5 earthquake in the site province included 60 horizontal components (30 earthquakes). The earthquake magnitudes ranged from 4.4 to 5.4 (mean magnitude 4.8), and the epicentral distances ranged from 1.7 to 33.2 kilometers (mean epicentral distance 15.0 km). The selected accelerogram data set included 26 recordings from California (14 from 1975 Oroville earthquake sequence) and 34 recordings from the 1976 Friuli, Italy earthquake sequence. The mean response spectra for this data set is presented on Figure 2.

The data set of accelerograms recorded from moderate sized earthquakes at epicentral distances greater than 50 kilometers is limited because of low acceleration at greater distances. Selection from this data was restricted to those site conditions representative of Rowe. Eight (8) components (four earthquakes) met the seismicity-distance criteria; namely, a magnitude 5.5 to 6.0 earthquake associated with the Cape Ann or Ossipee plutons (epicentral distances 188 km and 178 km, respectively) or a magnitude 5.0 to 5.5 event associated with the Adirondack Province (minimum epicentral distance 70 km). These accelerograms, all from California earthquakes, have a magnitude range of 5.4 to 6.0 (mean magnitude 5.7) and an epicentral distance range of 53 to 83 km (mean epicentral distance 69 km). The shorter epicentral distances in the selected data set take into account the slower attenuation for eastern United States' earthquakes. The mean response spectra for the data set from distant sources are presented on Figure 3.

The horizontal seismic design response spectra recommended for the Rowe site (Figure 1) was obtained by enveloping the mean spectra derived for the

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Mr. Dennis L. Ziemann

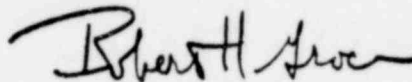
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site province (Figure 2) and for distance sources (Figure 3). The spectra developed for a seismic risk within the site province governs at periods less than .5 seconds while the spectra developed for seismic risk at distance sources governs at periods greater than .5 seconds.

A detailed report for the Site Dependent Response Spectra will be forwarded shortly. Should you have any questions relative to this matter, please contact us at your convenience.

Very truly yours,

YANKEE ATOMIC ELECTRIC COMPANY

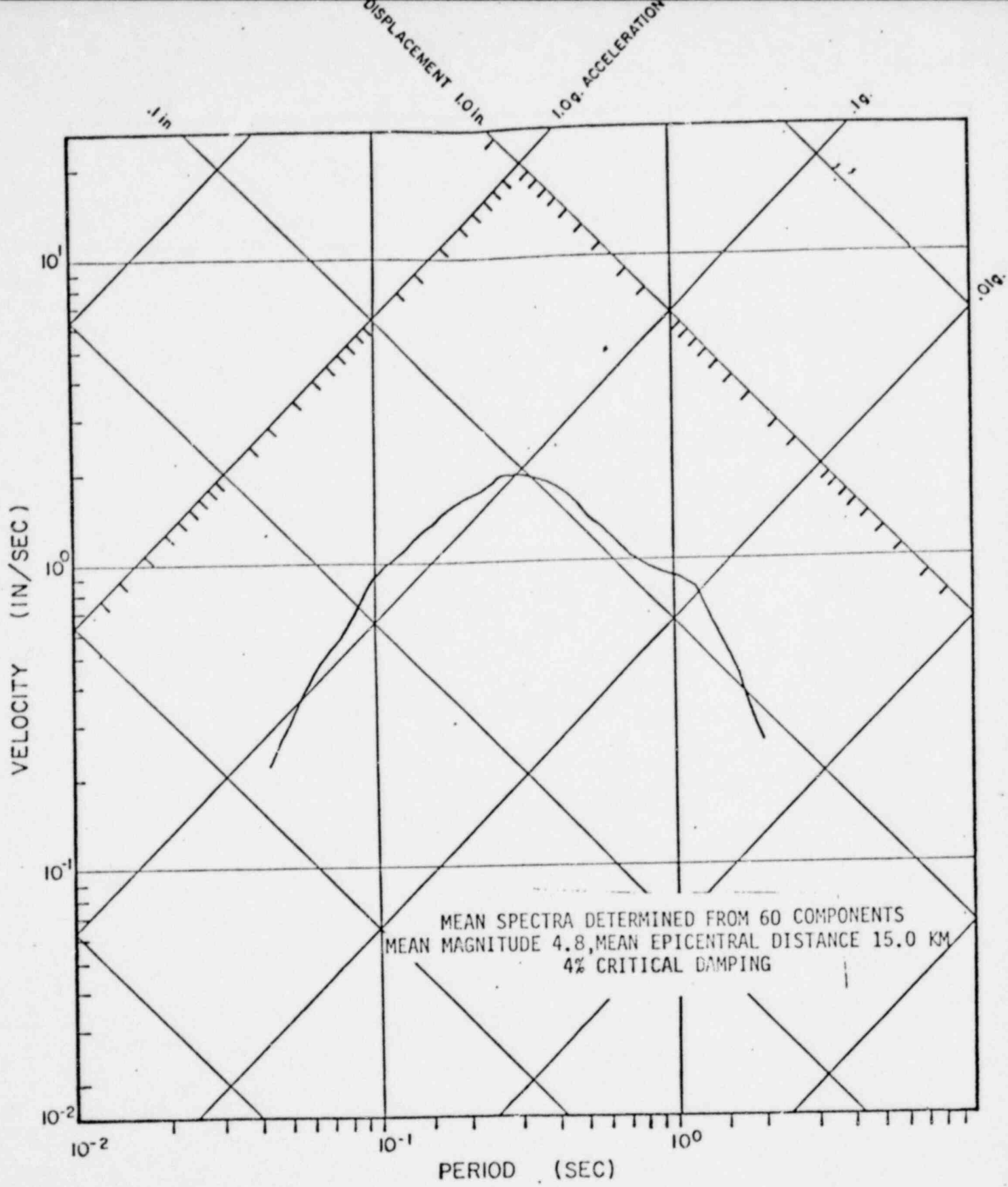


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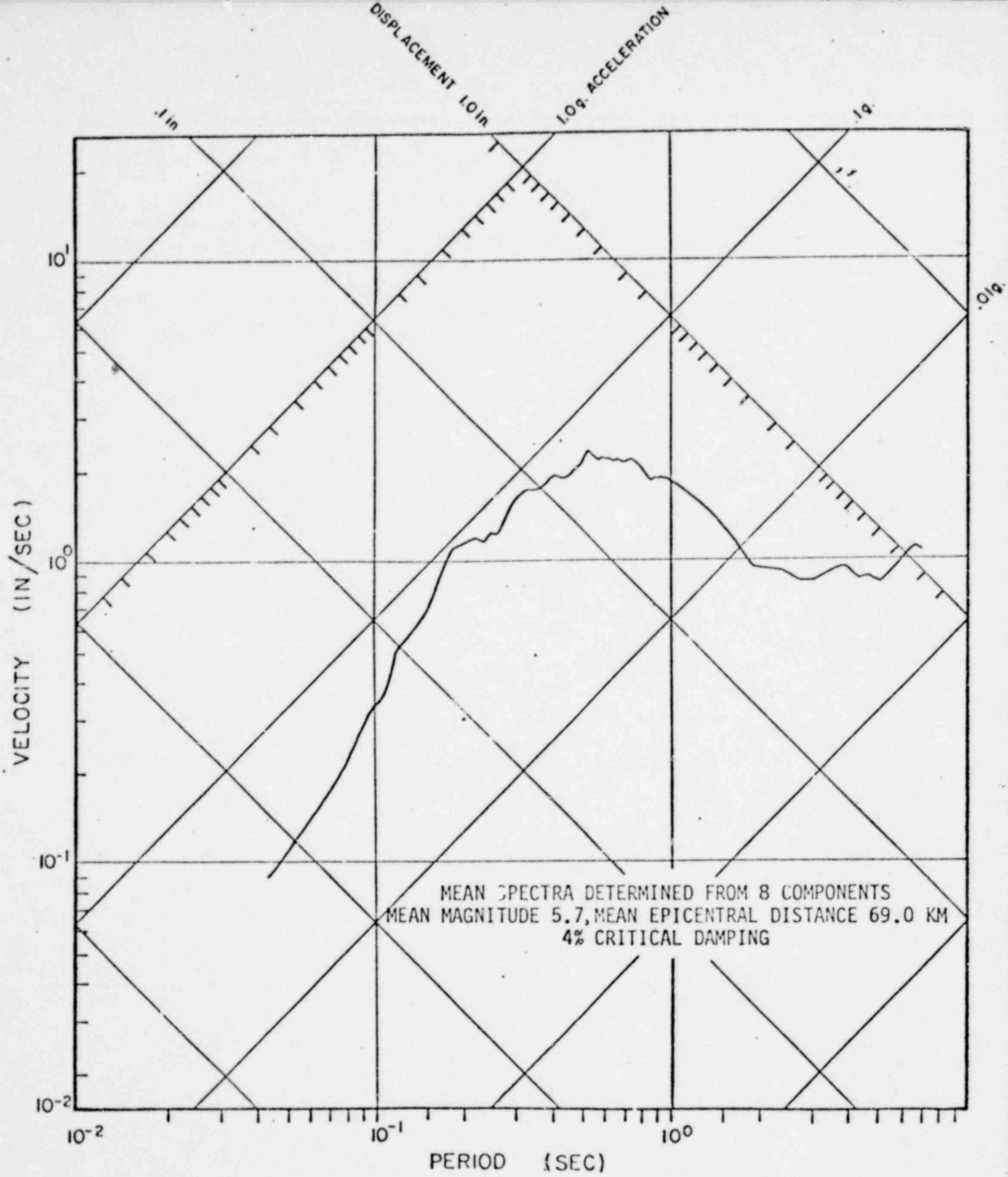
Enclosure

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Figure 2
 Weston Geophysical



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Figure 3