



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

JAN 25 1979

MEMORANDUM FOR: Harold R. Denton, Director  
Office of Nuclear Reactor Regulation

FROM: Saul Levine, Director  
Office of Nuclear Regulatory Research

SUBJECT: ENDORSEMENT OF PROGRAM BRIEF ON SITE SPECIFIC  
RESPONSE SPECTRA

In response to your request for funding of the project on Site Specific Response Spectra at the Lawrence Livermore Laboratory, RES has reprogrammed the FY1979 funds to make available the \$130K needed.

In accordance with SECY-77-130B, "Procedures for Processing User Office Research Requirements," I am requesting your endorsement of the enclosed program brief. Please indicate your concurrence by signing in the space provided below and return the original of this memorandum to me.

A handwritten signature in cursive script that reads "Saul Levine".

Saul Levine, Director  
Office of Nuclear Regulatory Research

Enclosure: as stated

cc: V. Stello, DOR  
D. G. Eisenhut, DOR  
D. K. Davis, DOR  
R. Denise, DOR  
R. E. Jackson, DSE  
D. Bunch, DSE  
L. S. Rubenstein, SD  
M. Aycock, NRR

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Endorsement:

I agree with the enclosed FY1979 Program Brief entitled, "SEP Site Specific Spectra Project."

*HR Denton*      *4/29/79*

Harold R. Denton, Director      Date  
Office of Nuclear Reactor Regulation

FY1979 PROGRAM BRIEF

PROGRAM: GENERAL REACTOR SAFETY RESEARCH

TITLE: SEP SITE SPECIFIC SPECTRA PROJECT

CONT: FIN  
CONTRACTOR: LLL  
SITE: LIVERMORE  
STATE: CALIFORNIA

PROJECT MANAGER: G. BAGCHI

TECHNICAL MONITOR: L. REITER

PRINCIPAL INVESTIGATOR: D. L. BERNREUTER

OBJECTIVE OF PROGRAM:

TO DEVELOP PROCEDURES FOR THE DETERMINATION OF SITE-SPECIFIC RESPONSE SPECTRA  
TO EVALUATE THE SEISMIC INPUT PARAMETERS FOR A VARIETY OF NUCLEAR POWER  
PLANT SITES.

FY1979 SCOPE:

OBLIGATION: \$130K

## Task Description

### Task No.

#### 1. Assist NRC in seismic data base definition.

FY 79 Collect seismic data bases not included in the NEIS catalog and add them to the data base. Perform very modest cross-comparison data bases and make only significant corrections. Search the data base of a bias in intensity, such as changing quality of construction.

The FY79 effort is a minimal effort to enhance the credibility of the analysis by developing a data tape which is reasonably complete and correct (at least relative to the larger earthquakes) and to address the question of whether the older intensities are biased on the high side.

### Task No.

#### 2. Assist the NRC in the definition of seismic source regions.

FY 79 Review, in detail, the plausibility of activity on specific structures. Evaluate the effect of possible systematic errors in the seismic data base on possible alternative zonations. Review, in particular, the uncertainty in the location and size of the largest historical earthquakes.

The FY79 effort is designed to primarily ensure credibility of the analysis. Our effort here is very minimal. We feel that we must interact with NRC on the definition of seismic source regions to insure that we have developed the appropriate statistics, etc.

### Task No.

#### 3. Incorporate upper magnitude cut-off methodology.

FY 79 Modify the hazard analysis methodology to formally incorporate the distributions on upper magnitude cut-off. Evaluate the applicability of identifying other similar tectonic provinces elsewhere in the world and using a combined seismic history to analyze for an upper cut-off.

At the hazard levels of interest ( $10^{-3}$  -  $10^{-6}$ ), the upper magnitude cut-off drives the results. The FY79 effort should considerably improve the results in his hazard range. We feel that it is essential that this task be carried out.

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Task No.

4. Develop/select appropriate attenuation relations.

FY 79 Perform a regression analysis (similar to that performed by Bollinger) for a few selected earthquakes in the Central U.S. and in the Northeast U.S., e.g., the 1811-1812 earthquakes, the 1968 Central Illinois earthquake. We hope NRC can assist in defining at least one other earthquake with sufficient data in usable form for such an analysis. If feasible, we will include site soil data in the analysis. In addition, we want to evaluate the effect of distance on existing correlations between site intensity and response spectrum shape and a few approaches to try and reduce the uncertainty in the correlations.

Uncertainty in the attenuation relation is a major contributor to the hazard. The FY79 effort will tighten this uncertainty and will therefore significantly improve the results. This effort coupled with the FY78 effort performed by LLL will provide considerable insight into the choice of appropriate weighting factors in our final Bayesian analysis.

This is considered to be a very important aspect of our overall program. The only attenuation of intensity with distance relation that has a statistical bases is that by Bollinger for the Charlestown earthquake. His results must be verified for other regions. It is very important to use a true estimate of the mean and the appropriate value for the dispersion of the data about the mean in the seismic hazard analysis.

Task No.

5. Strong Motion Response of Large Industrial Facilities.

FY 79 As suggested by N. M. Newmark, this effort will attempt to relate the lack of damage to large steel complexes where strong ground motion has been recorded (Managua, Japan, San Fernando,...) to their added structural capability. This effort will assist Dr. Newmark in his analysis of the effective acceleration at each site. It may in the end be the most significant task of all.

Task-No.

6. Retention of experts and incorporation of their expert opinion.

FY 79 Retain selected seismologists with particular expertise in the tectonics and seismology of the site areas. A partial candidate list includes:

S. Alexander  
R. Herrmann  
N. Toksoz  
E. Chiburis

Solicit from these experts, with carefully developed questions, information about the statistics of earthquakes, the maximum earthquake, and attenuation relations. Encode this information and include in the Bayesian hazard analysis.

This is an essential ingredient to a proper Bayesian analysis. Will significantly enhance the credibility.

Task No.

7. Site hazard analysis

FY 79 Extend the sensitivity study to include the expert opinions and the results from other FY79 studies. Prepare a formal report summarizing results.

This is a minimal effort to develop the seismic hazard at each site and include interaction with NRC and the Owner's.

Task No.

8-10. Travel, presentations, communications

FY 79 This allows for monthly trips to Washington, D. C. for the required extensive interaction with the NRC. It also allows for several meetings with the Owner's Group or the individual operators to familiarize them with the program, to solicit their expert opinions, and to discuss preliminary results.

Considering the type of analysis being performed and the necessary interactions required, a large travel budget is necessary.

**MILESTONES**  
**SEP SITE SPECIFIC SPECTRA**

TASK	DEC. 78	MARCH 79	JUNE 79
1. Assist NRC in Seismic Data Base definition	▲		
2. Assist NRC in definition of Seismic Source Regions		▲	
3. Incorporate Upper Magnitude Cut-Off Methodology	▲		
4. Assist NRC in definition of Attenuation Relations	▲		
5. Strong motion response of large industrial facilities	▲		
6. Retention of consultants and incorporation of expert opinion		▲	
7. Site hazard analysis including reports			▲

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