UNITED STATES
NUCLEAR REGULATORY COMMISSION
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MEMORANDUM FOR: Raymond F. Fraley, Executive Director
Advisory Committee on Reactor Safeguards

FROM: J. E. Richardson, Chief
Mechanical/Structural Engineering Branch
Division of Engineering Technology, RES

J. P. Knight, Acting Director
Division of Engineering, NRR

SUBJECT: STATUS OF NRC AND INDUSTRY ACTIVITIES ON SEISMIC DESIGN MARGINS

We understand that Dr. Okrent and Dr. Siess will be reviewing the NRC work associated with the quantification of seismic design margins as part of the ACRS annual report to Congress. To assist them in their review, this memorandum provides the status of NRC and utility actions on the various recommendations which the ACRS has made in recent ACRS reports on operating licensing applications regarding seismic design margins evaluations, as well as work being pursued under the generic approach recommended in the January 18, 1984 ACRS letter on seismic design margins. Also included is a status of NRR and RES work being carried out in the area of quantification of seismic design margins. Funding levels are not included here but will be presented to the ACRS in closed meetings in accordance with NRC policy.

1. Licensing Activities

Enclosure 1 summarizes the NRC staff actions taken on 16 recent licensee applications. In each case, the related conclusions from the relevant ACRS letter is summarized and the staff action or resolution given.

With respect to generic and plant specific seismic PRAs, the staff has completed its review of Zion, Indian Point 2 and 3, and Limerick. It is presently reviewing seismic PRAs for Millstone 3, Seabrook and GESSAR and Diablo Canyon. A limited review of the Midland PRA will also be carried out. A possible vehicle for additional seismic PRAs is the Integrated Safety Assessment Program (ISAP). The extent to which plant-specific PRAs can be carried out for ISAP will be investigated during a 2-year pilot program. The Expert Panel on Quantification of Seismic Design Margins has recommended that requiring plant-specific seismic PRAs should not be the principle vehicle for finding a screening method for seismic design margins. At present we have no plans to require utilities to carry out additional seismic PRAs aside from those already being carried out.

2. NRC Approach to Seismic Design Margins

NRR and RES have formed the Seismic Design Margins Working Group as stated in the memorandum to J. C. Ebersole from W. J. Dircks, dated April 12, 1984. This working group is composed of representatives from the relevant divisions of NRR and RES and co-chaired by the two of us. The purpose of the working group is to formulate and recommend a course of action to address the seismic design margins issue in a coherent and timely manner. In addition, we have established through our contractor, Lawrence Livermore National Laboratory, a group of expert consultants to assist us in formulating a workable plan. Since the working group was formed earlier this year, it has met with the expert consultants, or by itself, eight times. In addition, the expert consultants have met seven times. During these meetings, we have struggled with several difficult issues, including the definition of design margins, tasks to be accomplished, objectives and basic approaches to achieve the objectives. The result of this effort is an initial draft of the Seismic Design Margins Program Plan (Enclosure 2). This plan represents the consensus of the expert consultants and general agreement by the NRC Working Group. Also enclosed, are two relevant papers by R. Kennedy, one of our expert consultants (Enclosures 3 and 4), "Various Types of Reported Seismic Margins and Their Uses" and "Dominant Contributors to Seismic Risk - An Appraisal." Although these two papers do not necessarily represent a consensus of the expert consultants, nor the working group, they do provide a starting point for discussion. We plan to meet with the ACRS Subcommittee on Extreme External Phenomena in late March 1985, to discuss this plan. We anticipate completing the first four tasks of Phase I by April 1985. Based on the results of these four tasks, we hope to establish a set of screening guidelines to be applied in plant reviews. Initial trial plant reviews should be started before the end of FY 1985. In the meantime, other activities, including interactions with industry and NRR and RES programs are underway. These activities are described below.

3. Interactions with Industry

The NRC and EPRI jointly sponsored a workshop on "Nuclear Power Plant Re-evaluation for Earthquakes Larger Than SSE" on October 15-17, 1984. This workshop was attended by representatives from various utilities, NSSS vendors, architect engineers and consultants, as well, and EPRI and NRC. During this workshop, papers were presented and discussed, including Enclosures 3 and 4 (discussed above). Cooperation and coordination with EPRI in the area of seismic design margins is continuing. For example, NRC is cooperating in two EPRI research projects (soil-structure interaction experiments in Taiwan and pipe capacity tests).

Recently, NRC management met with representatives from three utilities and EPRI to discuss the EPRI and NRC eastern U.S. seismicity studies. It was agreed that these two programs would be closely coordinated over the coming months to maximize communication and understanding. In addition, it was agreed to establish a communication and coordination link between the NRC and industry in the area of seismic design margins. Efforts are underway to initiate this interaction. This interaction will include industry review and participation to the extent practicable in the NRC ongoing and planned programs described below.

4. NRC Programs

NRR is devoting staff time and technical assistance funds in the following projects:

A. Eastern U.S. Seismicity Studies, including contracts with Lawrence Livermore National Laboratory, and the USGS, as well as interactions with EPRI

B. Evaluation of licensee submitted PRAs, including GESSAR, Seabrook and LaSalle

C. Diablo Canyon

PES is sponsoring seismic margins work in the following areas:

A. Seismic Input

1. Regional Programs
2. Topical Programs
   - Source Parameters
   - Propagation/Attenuation Characteristics
   - Site Response Characteristics
   - Soil Failure
3. Programs to Address Uncertainties
   - Seismic Hazard Characterization
   - Earthquake Recurrence Intervals
   - Site-Specific Response Program

B. Methods Development and Validation

1. SSMRP Simplified Methods (BWR)
2. Validation on Seismic PRA Methods
3. Cooperation with HDR Program (FRG)
4. Structural Computer Code Benchmarks

C. Fragility and Response Data Base

1. Component Fragility Tests
2. Category I Structures Program
3. Piping Capacity and Failure Modes

D. Applications

1. Seismic Design Margins
2. Piping System Reliability
3. Load Combinations for Structural Design

Details of these programs have been presented to the ACRS and are not presented here.

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Enclosures: As stated

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