

July 25, 2001

MEMORANDUM TO: Daniel Dorman, Chief
Engineering Research Application Branch
Division of Engineering Technology
Office of Nuclear Regulatory Research

FROM: C. William Reamer, Chief
High Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

SUBJECT: DRAFT TECHNICAL POSITION AND DISCUSSION
(COMMENTARY) FOR PROPOSED REVISION 2 TO
REGULATORY GUIDE 1.60, "DESIGN RESPONSE SPECTRA
FOR SEISMIC DESIGN OF NUCLEAR POWER PLANTS"

We have reviewed the draft regulatory position for Proposed Revision 2 to Regulatory Guide 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants." This regulatory position appears not to be a stand-alone-document because the bases for the development and the justification for the assumptions used for generating the response spectra used in the design of nuclear power plants are discussed in two other supporting NUREG/CR documents (McGuire et al 2001a, and 2001b). In order to follow the procedures discussed in this position, consider including a statement in the Introduction that indicates that a good working knowledge of these two documents is needed.

The procedures discussed in the position were tested mainly at two sites, one in the Central Eastern United States and one in the Western United States. We believe further testing of the procedures at several sites having different soil thicknesses should be considered before issuing it as a Regulatory Guide. This will ensure that the procedures recommended in the position work well for developing design spectra for different soil sites in the United States. In addition, the scientific community is working on enhanced procedures for developing another state-of-the-art design response spectra for soil sites consistent with rock hazard spectra.

D. Dorman

-2-

The review by Dr. Asadul Chowdhury of the Center for Nuclear Waste Repository Analyses and Dr. Bakr Ibrahim generated the attached comments. Also, the position would be enhanced if the different steps used in generating the response spectra for rock and soils are illustrated by figures.

If you have any questions, please contact Dr. Ibrahim of my staff. He can be reached at (301) 415-6651.

Sincerely,

/RA/

C. William Reamer
High Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Attachment: Comments on Draft Technical Position

D. Dorman

-2-

The review by Dr. Asadul Chowdhury of the Center for Nuclear Waste Repository Analyses and Dr. Bakr Ibrahim generated the attached comments, which need to be addressed before the issuance of the position. Also, the position would be enhanced if the different steps used in generating the response spectra for rock and soils are illustrated by figures.

If you have any questions, please contact Dr. Ibrahim of my staff. He can be reached at (301) 415-6651.

Sincerely,

/RA/

C. William Reamer
High Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Attachment: Comments on Draft Technical Position

Distribution:

File Center CNWRA NMSS r/f HLWB r/f DWM r/f R. Kenneally
A. Murphy P. Justus K. Stablein M. Nataraja J. Stamatakos N. Chokshi
A. Chowdhury

ADAMS Accession Number: ML012130100

Document Name: S:\DWM\HLWB\AKI\ReamerSHER.wpd

OFC	HLWB	HLWB	HLWB
NAME	A. Ibrahim aki	D. Brooks djb	C.W. Reamer cwr
DATE	07/23/01	07/23/01	07/25/01

OFFICIAL RECORD COPY

ACNW: YES ___ NO X Delete file after distribution: Yes X No ___

- 1) This document should/should not be made available to the PUBLIC ___YES___aki___ / /
- 2) This document is/is not related to the HLW program. If it is related to HLW, it should be placed in the LSS. ___YES___aki___ / /

COMMENTS ON DRAFT TECHNICAL POSITION
FOR PROPOSED REVISION 2 TO REGULATORY GUIDE 1.60

- P. 1. The introduction section uses inconsistent terms: design spectra, design response spectra, and seismic design spectra. Use of consistent terms will avoid potential confusion.
- P. 2. In the light of current knowledge about seismicity, ground motion, and performance record of existing nuclear power plants, it will be prudent reexamine the use of the typical value of 0.0001 annual frequency of exceedance level for uniform hazard spectrum (UHS) amplitudes.
- P. 2. Clarify the physical meaning of Uniform Reliability Spectrum (URS) ($URS = UHS * SF$) for some sites and natural frequencies exceeds or lies below the UHS?
- P. 2. Provide the rationales for choosing $A_R(f)$ as the ratio $SA(f, 10^{-5}) / SA(f, 10^{-4})$ rather than the ratio $SA(f, 10^{-4}) / SA(f, 10^{-3})$ or $SA(f, 10^{-5}) / SF(f, 10^{-3})$.
- P. 4. Be specific in defining "fault distance." Different authors have different definitions for such term.
- P. 5. Provide the rationales for the selection of Equation 3 ($SF = \max \{0.7, 0.35 A^{1.2}\}$) to calculate the Uniform Reliability Spectra ($URS = SF * UHS$).
- P. 6. Provide the rationales for choosing 20% rather than other percentile as the basis for the spectra comparison between Step 1 and Step 2.
- P. 7. Provide the rationales for making the statement "The two scaled spectra should not fall below the URS by more than 10% at any frequency."
- P. 8. Replace $PGA * PGD / PGV^2$ by $PGA * PGD / PGV^2$.
- P. 9. Clarify the term ($*/1.5$ of bin medians) or express in words.
- P. 9. If there is no intersection frequency (f_c) of the two scaled spectra, what other criterion is recommended?
- P. 13. Equation 6 should be consistent with Equation A-17 in McGuire et al, 2001b or vice versa.
- P. A-1. Explain why epistemic uncertainty needs to be characterized, but not aleatory uncertainty?
- P. A-2. Provide the justification for using the 10 Hz and 1 Hz in this Regulatory Position rather than the average of 5-10 Hz and 1-2.5 Hz used in previous studies
- P. B-1. Provide the rationales for choosing the range 20 to 40 rather than another range for R_p (the factor between the UHS and the component failure frequency) and 1.67 for

F_{sm} (seismic margin factor) noting that the scaling factor SF used in calculating the URS depends on these two parameters.

- P. C-1 It is stated in Appendix C that the response is controlled by a static portion (governed by PGA) and a dynamic portion (governed by equation 4.10) but no mention of or reference to equation 4.10 in the regulatory position.
- P. C-2 Provide or give a reference for Tables 4-6 thru 4-9 in Appendix C.
- P. D-2 Provide the range of uncertainty for the 100-200 km cross correlation for the WUS rock and soil site conditions in tables D-1 and D-2. If negligible, indicate so.
- P. D-4 Correct the magnitude range used in the correlation statistics for WUS Rock Site Conditions (P. D-4, Table D-1) from M 7.01 to 9.0 to M 7.01 to 8.0 to be consistent with Figure D-1. Similarly, for the table on P. D-7.
- P. D-8 The correlation acceleration pairs H1-H2 for WUS rock sites for different magnitudes exhibit a minima around 70 km. Is there any explanation for such minima?

References

McGuire et al. (2001a). Technical Basis for Revision of Regulatory Guidance on Design Ground Motions: "Hazard and Risk Consistent Ground Motion Spectra Guidelines", Risk Engineering, Inc. (NUREG/CR xxxx, 2001).

McGuire et al. (2001b). Technical Basis for Revision of Regulatory Guidance on Design Ground Motions: "Development of Hazard and Risk Consistent Seismic Spectra for Two Sites", Risk Engineering, Inc. (NUREG/CR xxxx, 2001).