

Enclosure 3
Random Vibration Theory (RVT) Slides
(Redacted)

generation

mPower

***Implementation of Random Vibration Theory
for Seismic Soil-Structure Interaction***

(Redacted Version)

This material is based upon work supported by the Department of Energy under Award Number DE-NE0000583.

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Presentation Outline

- Introduction / Background
- RVT for SSI Analysis
- Verification
- Summary and Conclusion

Introduction / Background

- Current practice for seismic SSI analysis utilizes time histories generated to match design response spectra
- Several methods are available to generate time histories
- The number of time histories required to obtain a stable mean response has been challenged recently in several studies involving SSI analysis
- The new ASCE 4 standard to be issued in 2013/2014 []
- The newly issued draft SRP 3.7.1 asks for closer inspection of power spectral density before a time history is used for design

[CCI per Affidavit 4(a)-(d)]

Introduction / Background

- The choice of appropriate seed time histories for CEUS sites is very limited
- Structural responses can vary considerably depending on the time history used as input, even when the input time histories are matched to the same design response spectrum
- For design, mean seismic responses are required
- Obtaining stable mean structural responses with limited time histories is challenging
- The RVT methodology avoids using time histories as input and works directly with the design response spectrum

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[CCI per Affidavit 4(a)-(d)]

Introduction / Background

- RG 1.208 permits RVT-based site amplification analysis
- RVT has been used in several recent COL applications for site response analysis and development of GMRS and FIRS
- The NRC has evaluated the RVT approach used by COL applicants by an independent program based on the RVT approach as reported in SERs
- One of the early applications of RVT for SSI analysis was formulated in the computer program PLUSH (1977)

RVT Approach

The main computational steps in the RVT approach are:

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[CCI per Affidavit 4(a)-(d)]

RVT Approach

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[CCI per Affidavit 4(a)-(d)]

RVT Formulation

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[CCI per Affidavit 4(a)-(d)]

RVT Formulation

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[CCI per Affidavit 4(a)-(d)]

RVT Process Steps

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[CCI per Affidavit 4(a)-(d)]

RVT Process Steps

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[CCI per Affidavit 4(a)-(d)]

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[CCI per Affidavit 4(a)-(d)]

VERIFICATION

Earlier Discussion on[

](May 2012)

RVT Topical Report Examples

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[CCI per Affidavit 4(a)-(d)]

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[CCI per Affidavit 4(a)-(d)]

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[CCI per Affidavit 4(a)-(d)]

- RVT has been used extensively for development of GMRS and FIRS
- A number of Safety Evaluation Reports have endorsed the results of RVT for site response analysis

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[CCI per Affidavit 4(a)-(d)]

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[CCI per Affidavit 4(a)-(d)]

- Obtaining mean seismic responses for design using the time history approach would require multiple sets of time histories

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[CCI per Affidavit 4(a)-(d)]

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Discussions