

**Meeting: New Plant Seismic Issues**  
**February 9, 2005 at 1:30 pm**  
**NRC Offices O-4B6**

Meeting Purpose: To discuss industry ideas and proposals for improving Reg. Guide 1.165 and addressing high frequency seismic issues

Industry participants: Cedric Jobe, NEI  
Adrian Heymer, NEI  
Bob Kassawara, EPRI  
Robert Kennedy, RPK Structural Mechanics  
Bill Schmidt, MPR, et al.

**Draft Agenda**

- 1:30 PM Introduction and Opening Remarks (NEI Letter to NRC dated 11/30/2004)
- 1:40 PM Issues arising from use of RG 1.165
- Industry proposals to address high frequency ground motion estimates
  - Development of performance based ASCE methodology
  - Characterization of seismic ground motion models
    - Revision of Lower Bound Magnitude Cutoff
    - Truncation of Log-Normal Distribution of Variability
  - Preliminary industry schedule
  - General discussion NRC-NRC
- 3:15 PM Public comments
- 3:25 PM Summary
- 3:30 PM Adjourn

Attachment

B-2

# Early Site Permit Seismic Issue Resolution Program

Presentation to USNRC

By NEI/EPRI

February 9, 2005

EPRI

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## Industry Goal

- Resolve generic issues in a timeframe to support the Administration's goals for nuclear power expressed in NP 2010
  - Change regulatory guidance, where necessary

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## Purpose of Meeting

Discuss:

- Experience and concerns with RG1.165 approach
- Need for revisions to RG1.165 methodology
- Industry program for
  - Evaluating performance-based methodology
  - Improving seismic hazard estimation methods (technology advances)
  - Treatment of non-damaging high frequency motions
  - Recommending revisions to RG1.165
- Future Industry/NRC interactions

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## Experience/concerns with RG1.165

- Causes regulatory and technical instability
  - Results for a given site potentially affected by results for 29 diverse, distant sites
- Process likely to deter many utilities from applying for ESP or COL
  - On-going potential for impact on resources and seismic design basis
- Method based on a reference *relative* probability not a *performance-based* (safety-based) approach

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## Resolution Plans

- Performance-based approach of ASCE /SEI 43-05 provides more realistic, stable seismic regulation
- ASCE method is performance-based and consistent with
  - NRC regulations
  - Recommendations of Nureg CR 6728
  - Past licensing practice
  - NRC policy statement on Risk-Informed Regulation
- Need to incorporate other technology advances in PSHA implementation

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## Industry program

- Industry program established to address concerns and improve process for determining site SSE spectra
  - EPRI technical lead
  - Expert review/advisory group

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## Industry Program (Cont'd)

- Tasks underway and planned include
  - Demonstrate generic applicability of ASCE/SEI 43-05 application
  - Improve seismic hazard estimation methodology to reflect technology advances
  - Updating and improving methods for addressing non-damaging high frequency portion of spectra
  - Developing proposed revisions to RG1.165

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## Task G1.1- Update Ground Motion Hazards and Assess ASCE Performance-Based Methodology

- Update EPRI hazard results to reflect latest codes, attenuation relationships, updated seismic sources, and updated ground motion model
- Compute performance-based seismic spectra for select number of sites
- Demonstrate generic applicability of performance-based methodology

*would this factor in site-specific properties?*

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## Task G1.2 - Revision of Lower Bound Magnitude for Hazard Integration

- Lower bound magnitude (LBM) used in hazard computation (i.e., magnitude at which damage may occur) has major impact on computed hazard levels, particularly for higher frequencies
- A realistic LBM cut-off would reduce hazard consistent with realistic damage potential of small earthquakes
- Task will study new observations of damage to industrial facilities and nuclear plant assessments to support a revised LBM. Higher damage resistance of new nuclear plants vs. industrial facilities will be considered

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Mw 4.6  
how would this  
affect  
recurrence?  
(lower mag  
events used  
to infer  
recurrence  
of lg events)

## Task G1.3 - Truncation of Lognormal Distribution of Variability on Median Ground Motion

- Current hazard analyses model variability w/*unbounded* lognormal distribution of variability (i.e., aleatory uncertainty) is unbounded
- Practice of using an unbounded distribution is unrealistic; however, no consensus bound exists
- Task objective is to define rational, defensible bound on variability (e.g., point where variability deviates from lognormal distribution)

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conservative  
to be unbounded  
but rationally should be  
bounded?

## Tasks S2.1 and S2.2 - Treatment of High Frequency (HF) Motions

- Analytical and observational data show that ground motion spectra for CEUS sites will contain high spectral accelerations at high frequencies (i.e., over ~ 10 hz), but the HF content has negligible damage potential
- Objectives of tasks S2.1 and S2.2 are to develop generic methods for accommodating HF motions considering
  - Effect of seismic wave incoherence (S2.1), and
  - Effect of limited inelastic behavior on response to HF input motions (S2.2)

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## Task S2.1 - Effects of Seismic Wave Incoherence

- Ground motion is measured at a point; studies show that *coherent* motion input to practical size structures is less than at a single point
- Structures respond effectively to coherent input motion
- Coherency of motion decreases w/ both physical dimensions and frequency of motion
- Task will assess recent work (e.g., for Diablo Canyon and in EPRI TR 102631) and develop incoherence corrections

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Taking on too much for the amount of time we have?

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## Task S2.2 - Effect of Limited Inelastic Behavior on Response to HF Input

- Several studies have evaluated effects of HF accelerations
  - EPRI NP5930 on OBE exceedance
  - Blast, shock and vibration testing
  - EPRI TR 102470 on effect of limited inelastic behavior
  - IPEEE implementation
  - NRC assessments of HF damage potential on existing plants
- All concluded HF accelerations (>10 Hz) have negligible damage potential for nuclear plants

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*incoherence  
corrections  
to the  
ground motion  
spectrum*

*even most  
→ brittle systems  
have sufficient  
capacity*

## Task S2.2 - Effect of Limited Inelastic Behavior on Response to HF Input (cont'd)

- Task will build on available knowledge/data to update and improve results of EPRI TR 102470
- NRC technical participation in task would facilitate timely resolution and is requested

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## Future NRC/Industry Interactions

- Feedback on today's meeting
- Updates and conclusions of on-going tasks
- Possible interactive NRC review/advisory role in Tasks S2.1 and S2.2 (HF issue) and approach for addressing old (1994) questions on EPRI HF study (TR 102470)
- Timing of review and resolution of HF issue
- Planning for revision of regulatory guidance in 2006 to support NP 2010

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