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Evaluation of the SRS Seismic Hazard Considering the EPRI 2013 Ground Motion Model

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Presentation to DOE NPH Workshop

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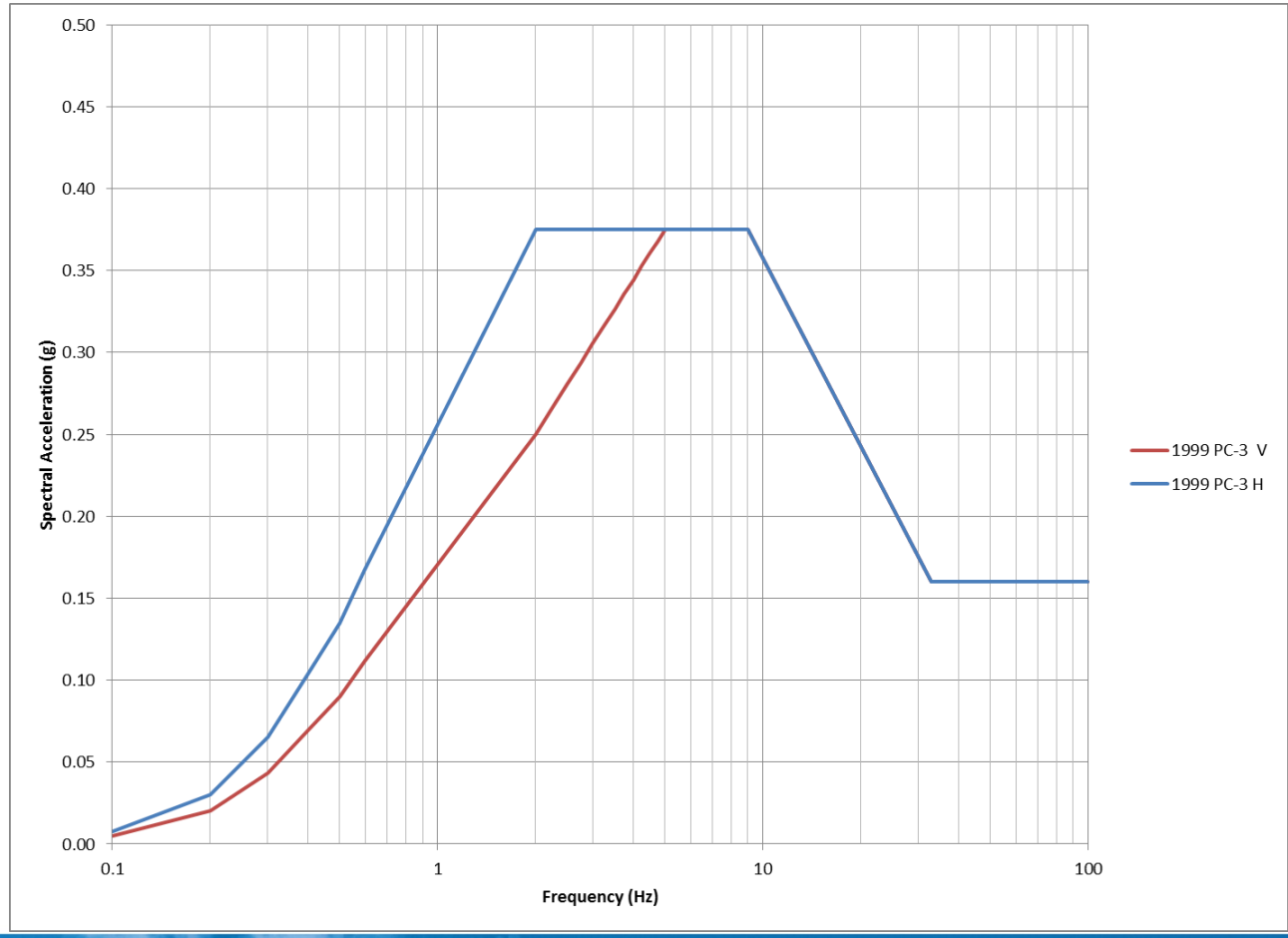
Presentation Overview

- Current Engineering Design Criteria
- PSHA Update
- New Information Available
- Proposed Path Forward

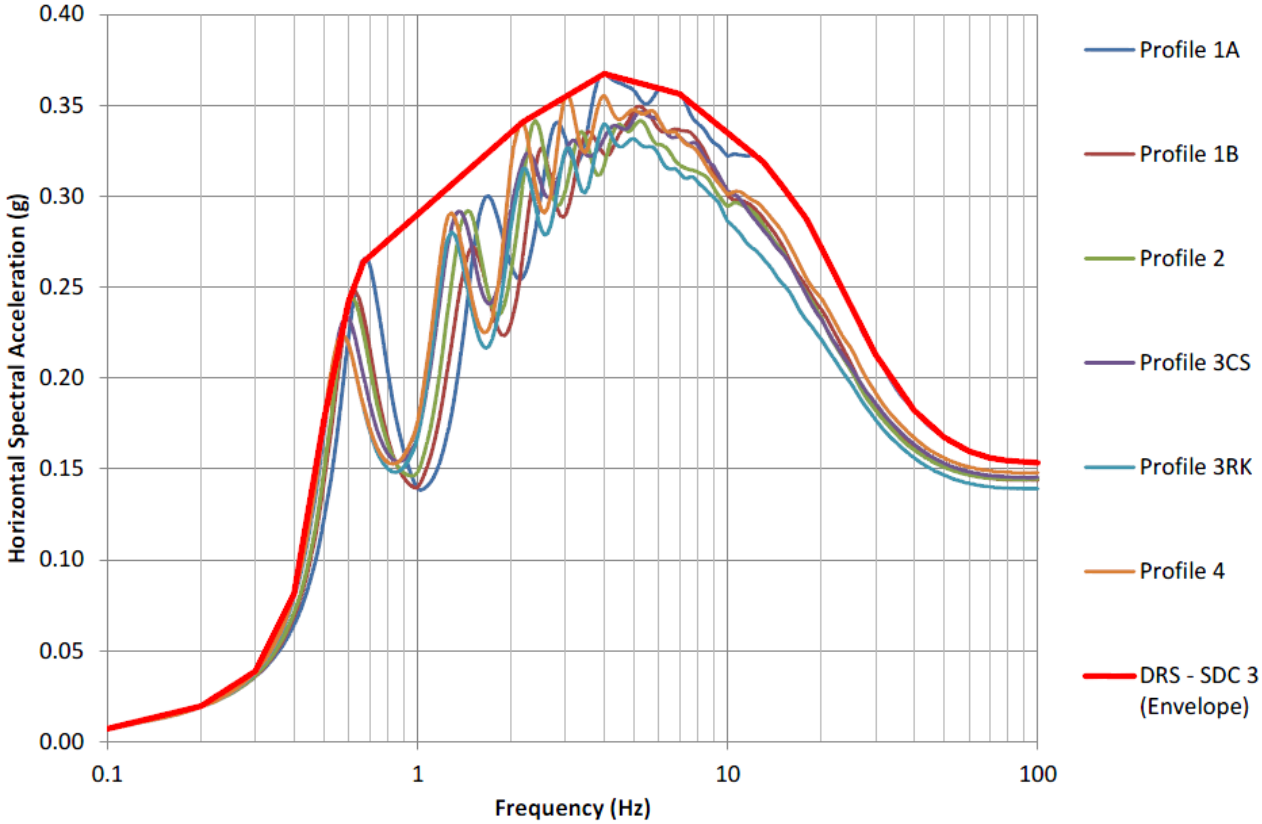
Current SRS Seismic Design Criteria

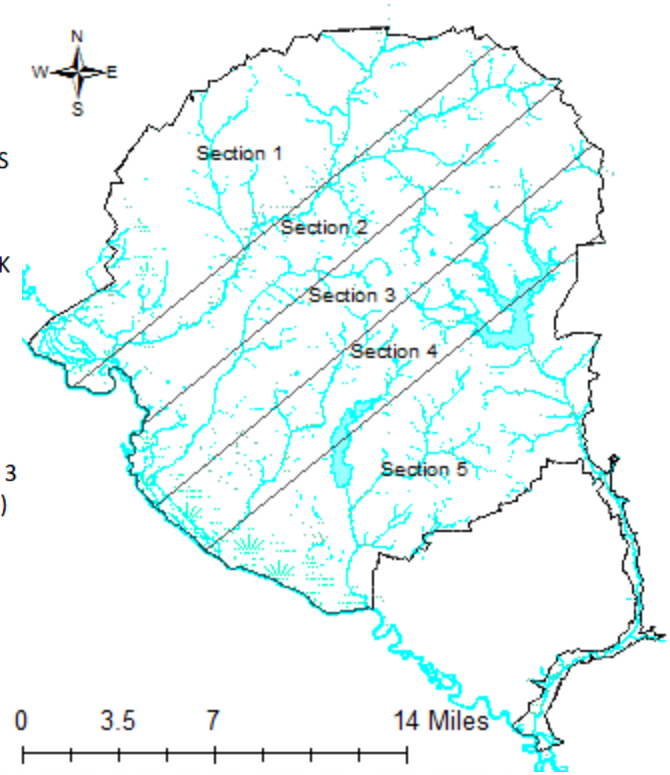
- Current Engineering Design Criteria
  - 1997 PSHA Report with 1999 Agreement
  - New PC-3 Facilities Include a 1.2 Load Factor



2014 SRS PSHA Update – Horizontal Surface Spectra

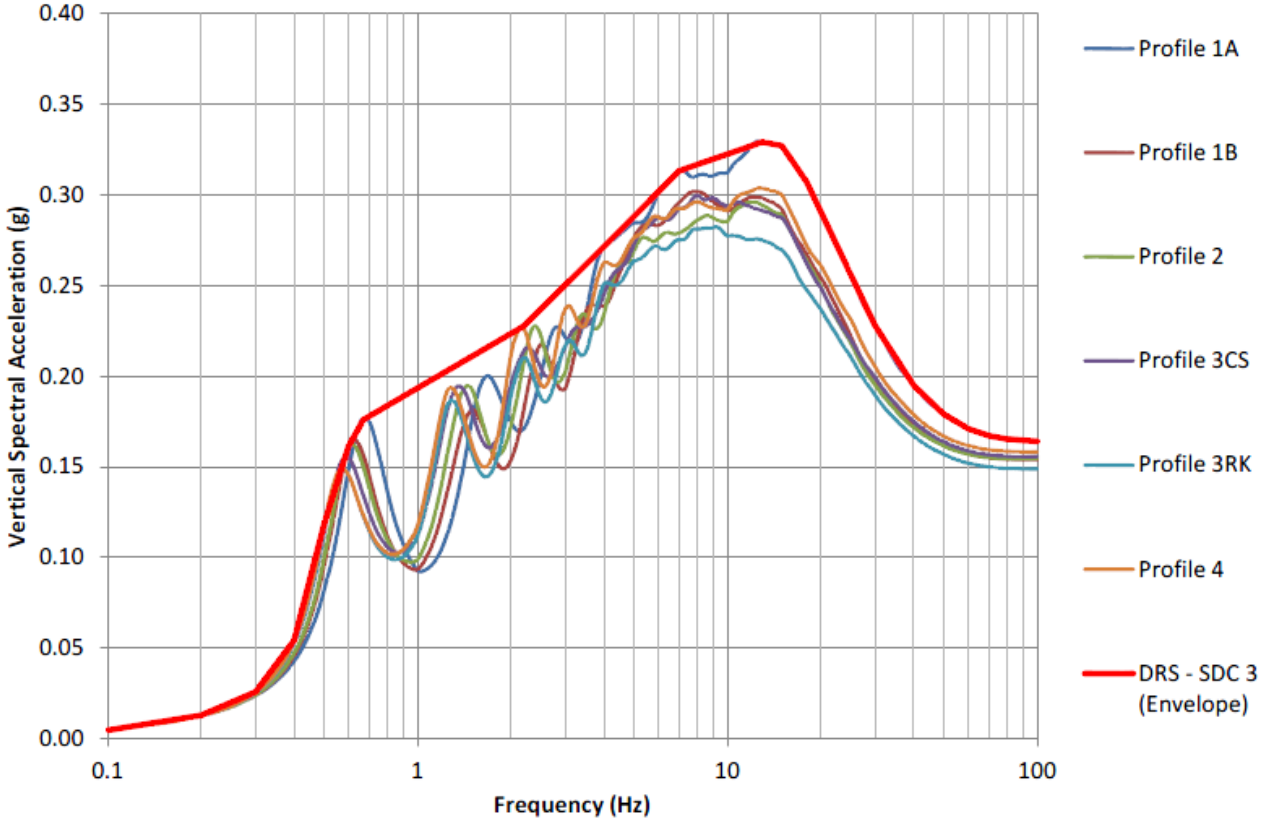
- CEUS SSC Model
- EPRI 2004/2006 Ground Motion Model

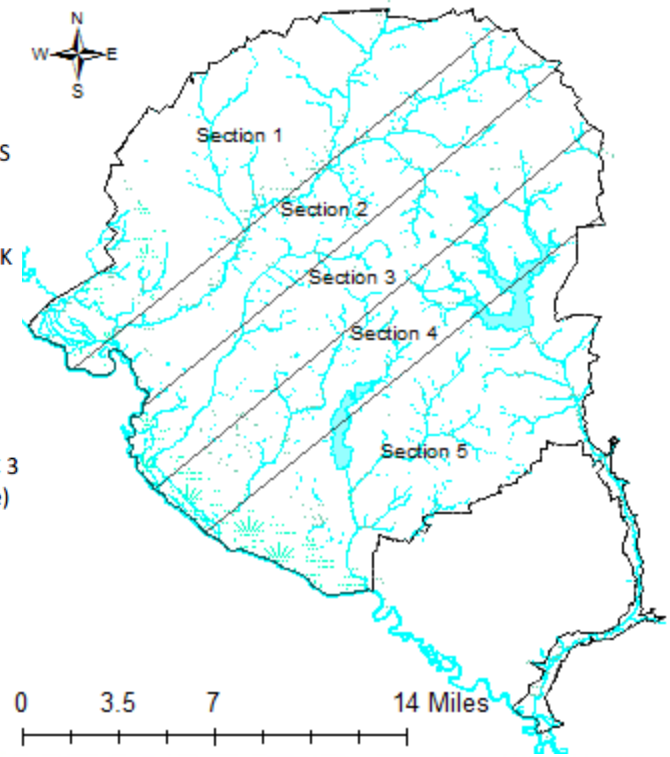




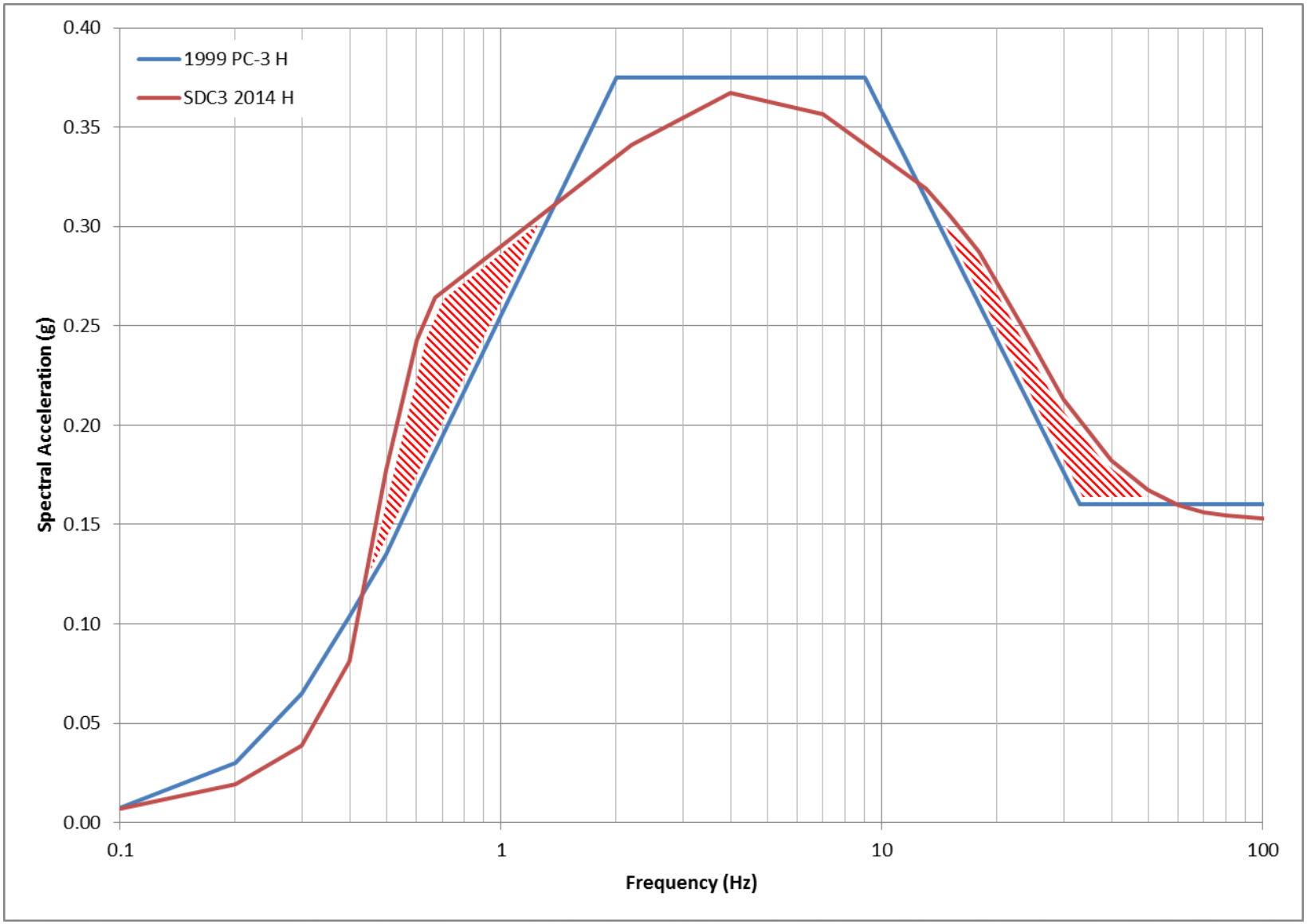
2014 SRS PSHA Update – Vertical Surface Spectra

- CEUS SSC Model
- EPRI 2004/2006 Ground Motion Model





Comparison of the Current and 2014 Horizontal Surface Spectra



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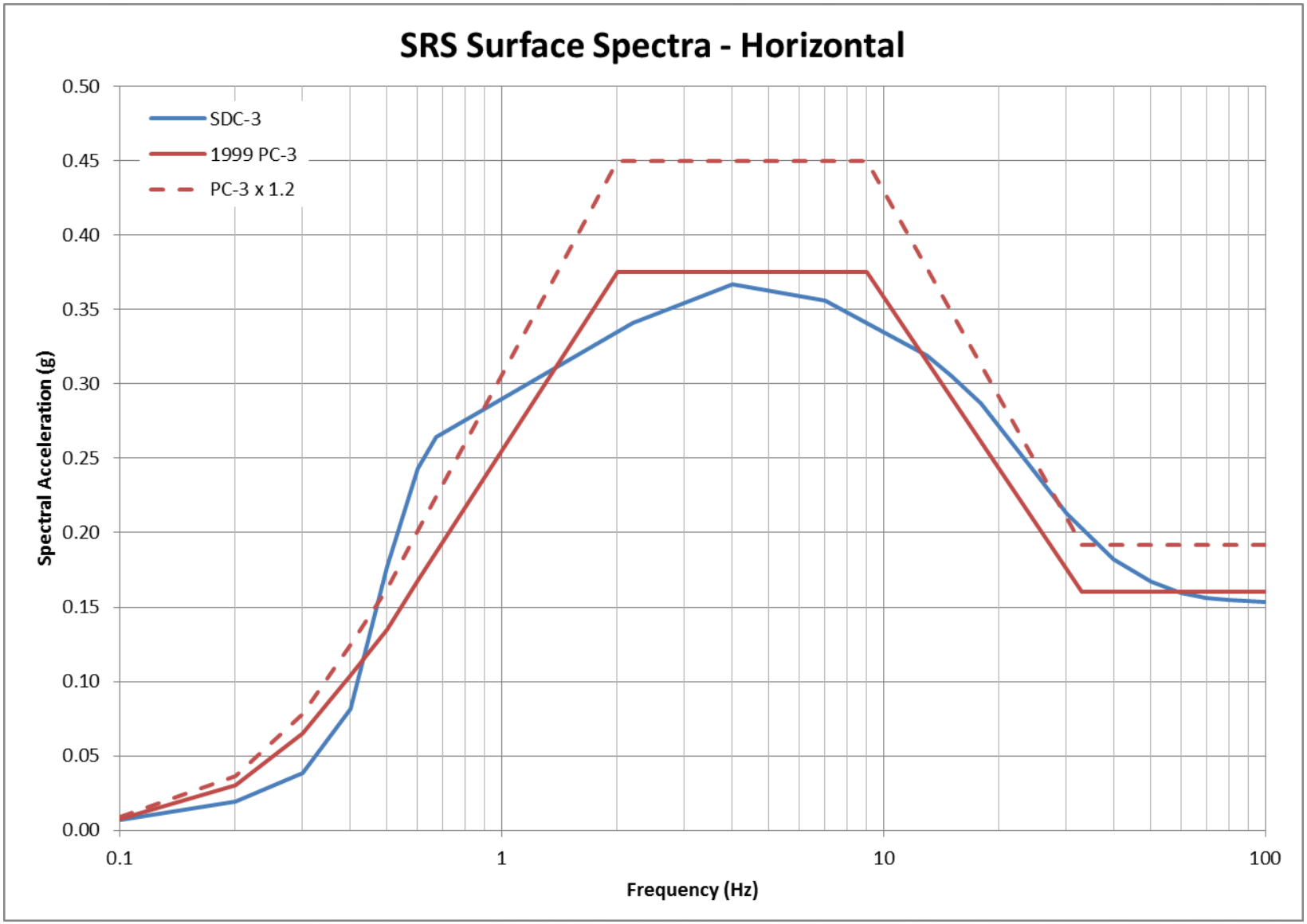
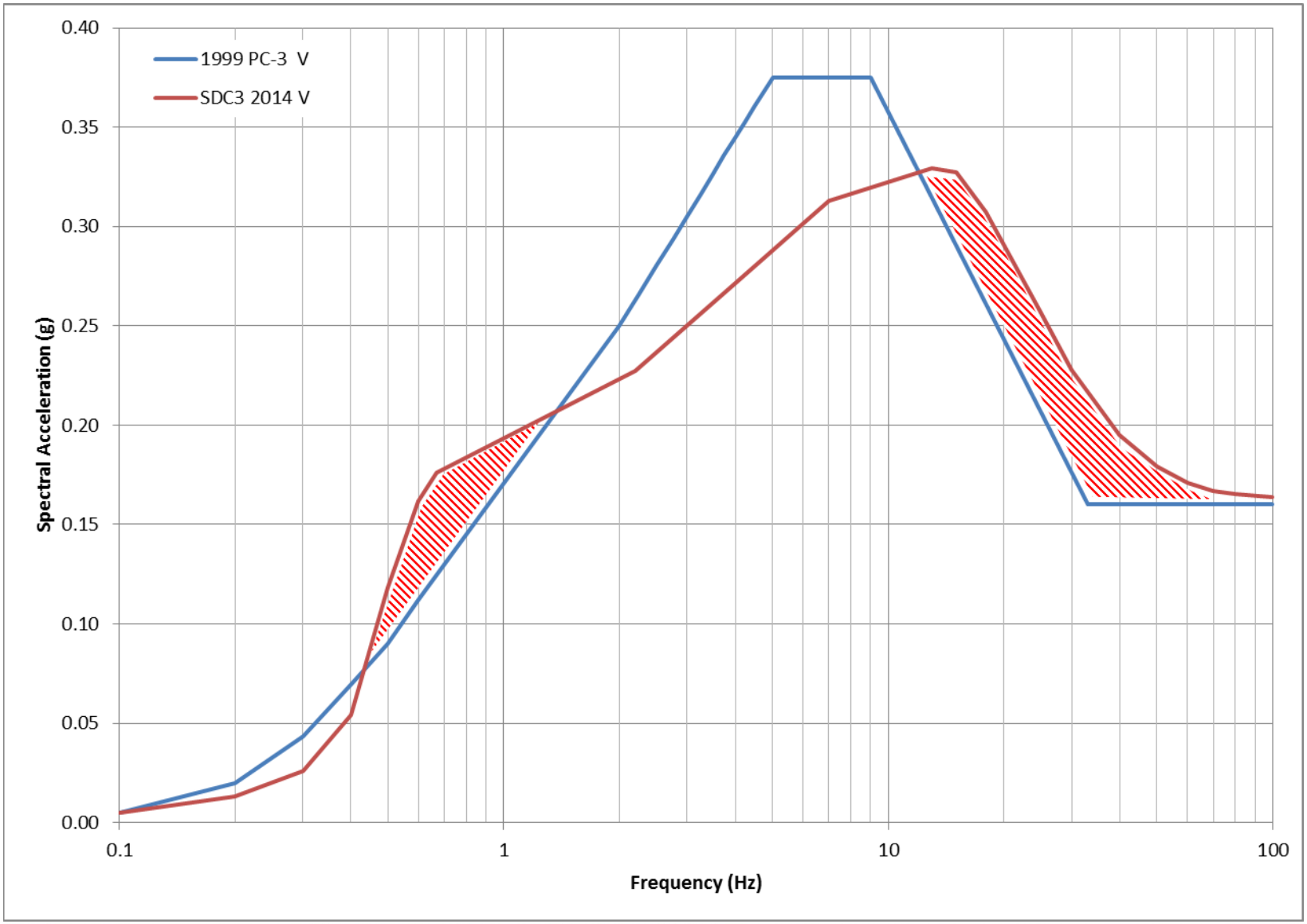
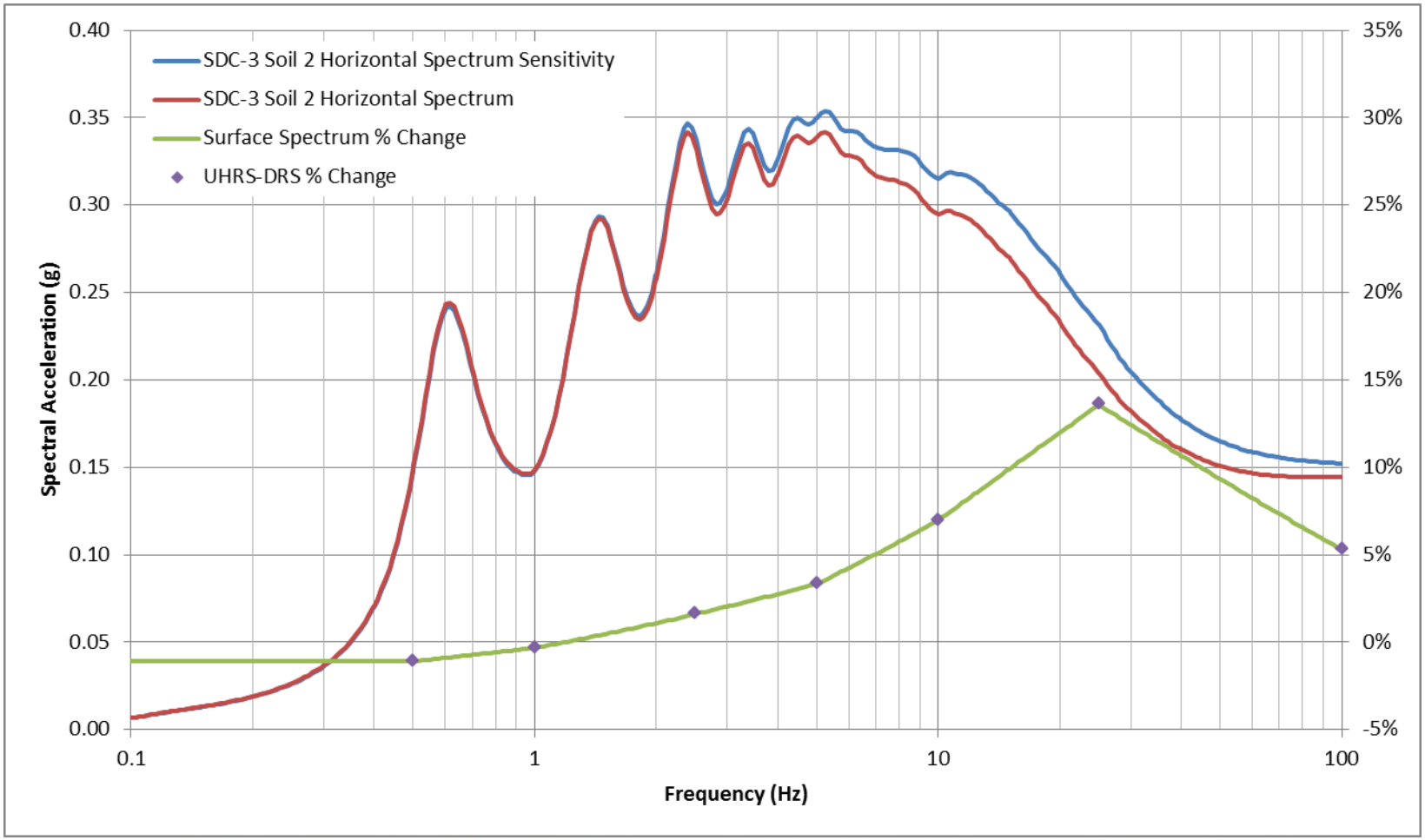


Comparison of the Current and 2014 Vertical Surface Spectra



Effect of Higher Frequency Earthquakes on PSHA Results

- Soil PSHA for Soil Profile 2
- 1×10^{-2} and 1×10^{-3} AFEs



Impacts of the 2014 PSHA Implementation

- Reevaluation of SSCs
- Liquefaction Analysis
- Several Dozen Facilities
  - Multiyear Endeavor
  - Expensive
- Mitigation Actions ?

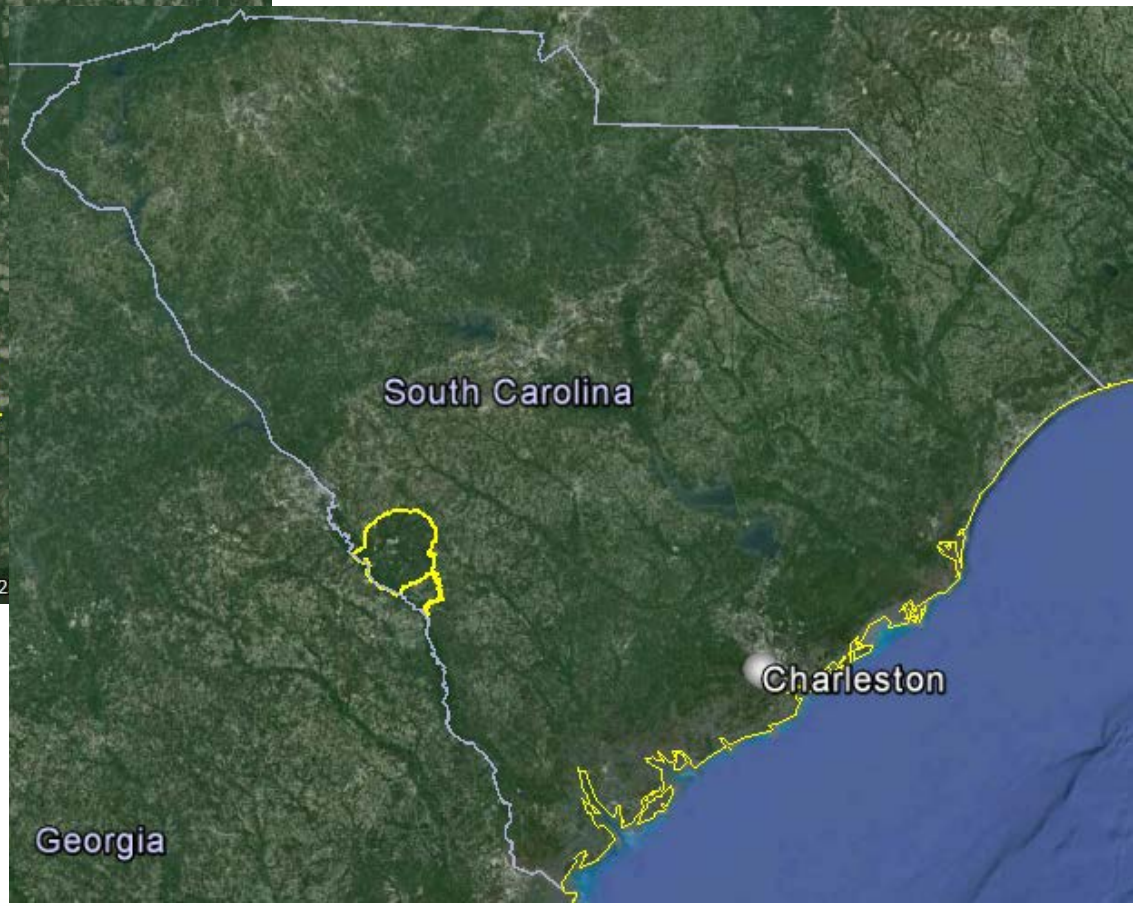
EPRI (2004/2006) Ground Motion Model (GMM) Review Project

- Recommended Updated EPRI 2004/2006
  - 7 of 13 Developers Recommend Replacing Their GMPES
  - 3 New GMPEs Developed in the Last Decade
  - 80% of EQ GM Database for NGA-East occurred after EPRI 2004
  - 2004/2006 Model Over Predicts Ground Motions for some M-D and Frequency Ranges

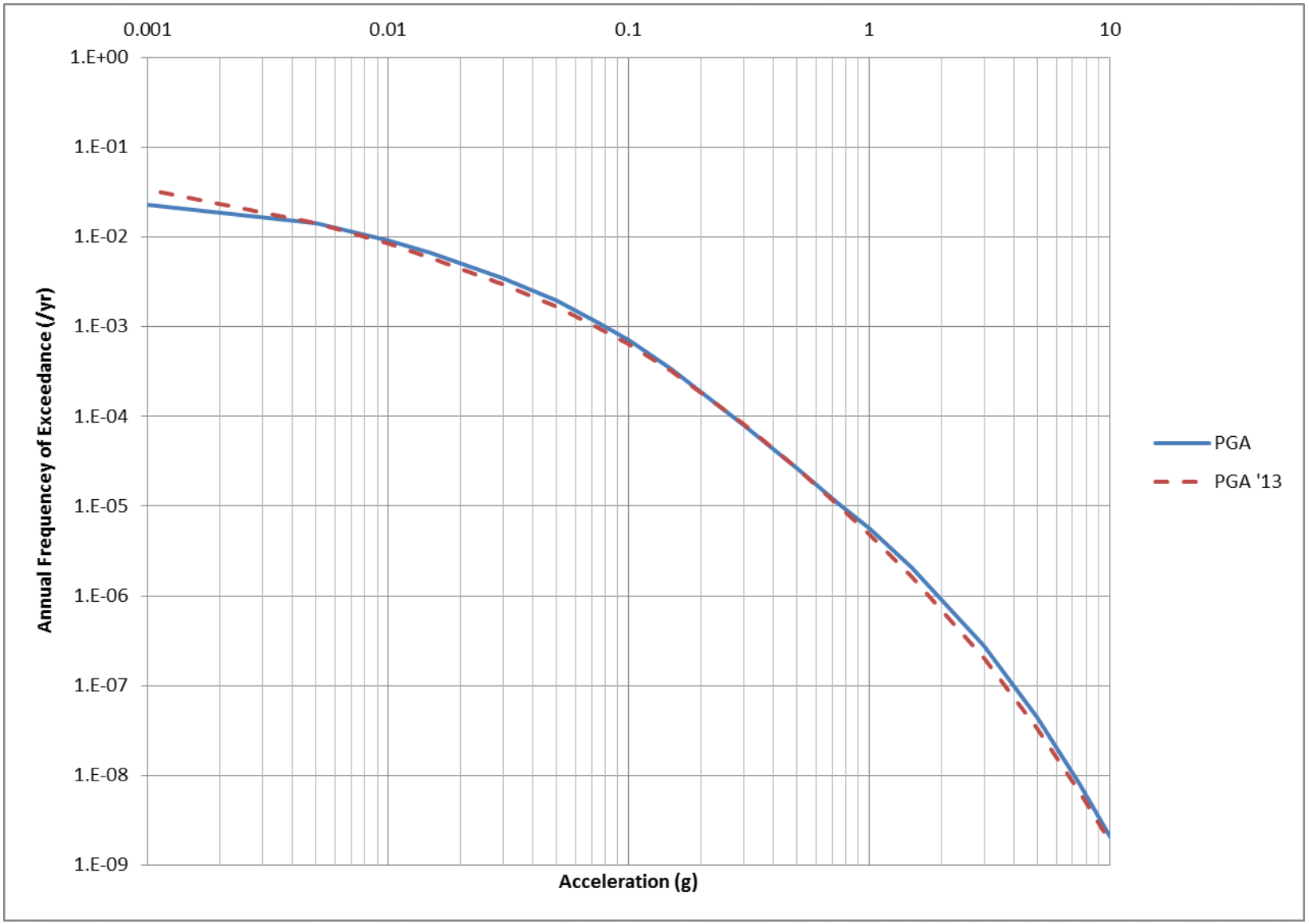
- Suitable for Use in Response to NRC 50.54(f) Letter
  - Pending Completion of NGA-East

- Reductions in Rock Hazard

Plant Vogtle and Savannah River Site



Vogtle Response to NRC 50.54(f) – Rock Hazard



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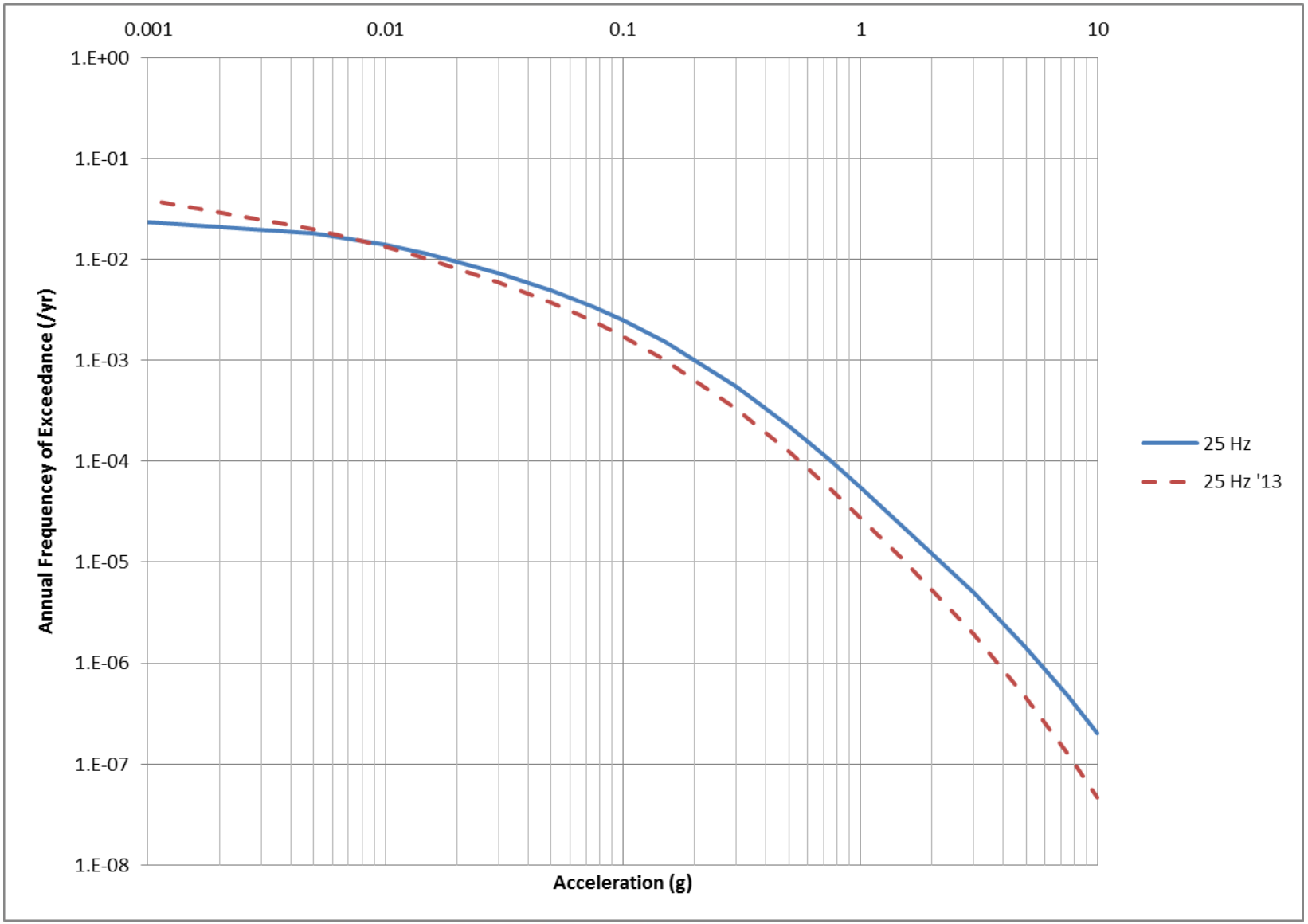
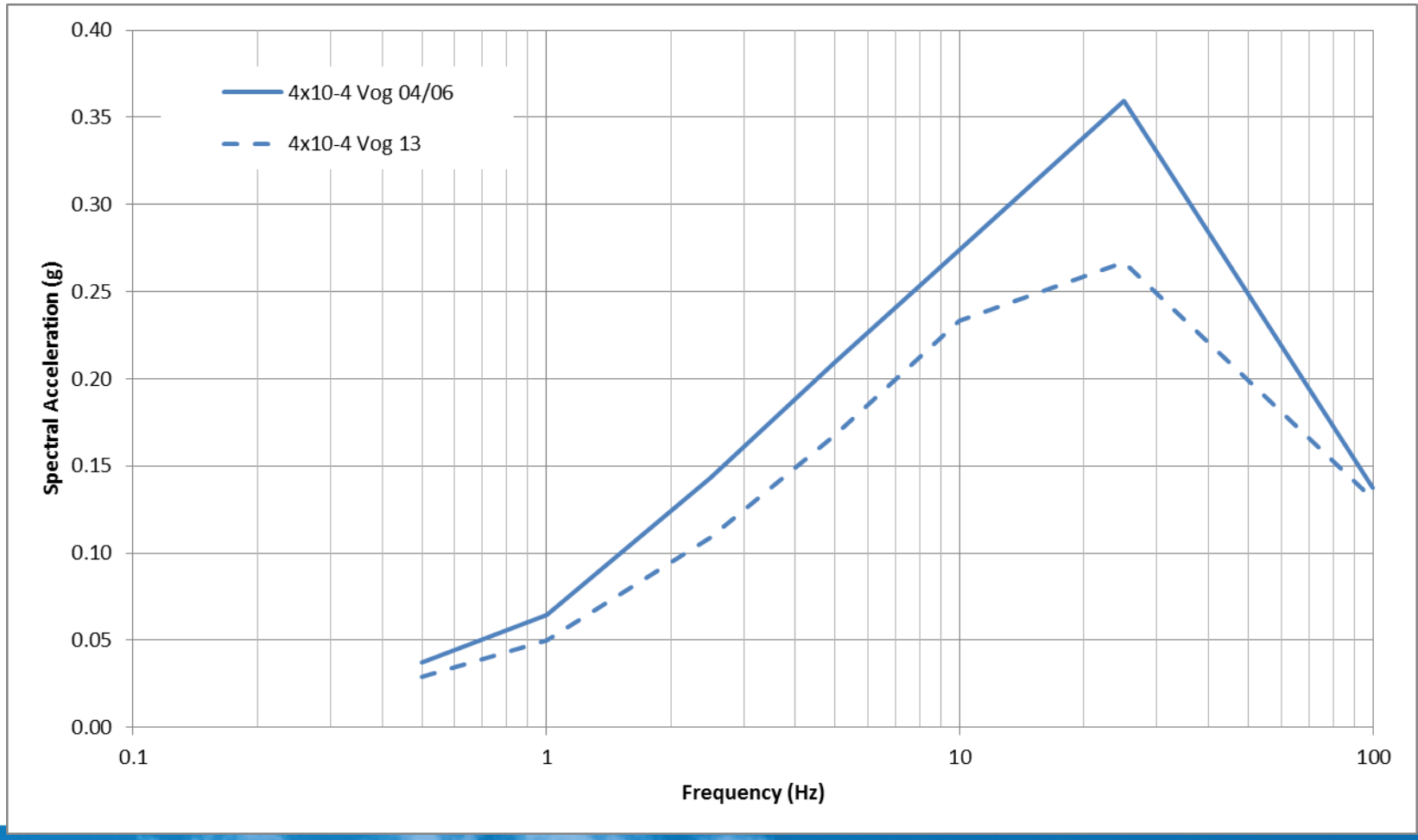


Change in the Vogtle Rock Hazard Curve

- Rock Hazard Reduced 4% to 26% at 4×10^{-4}

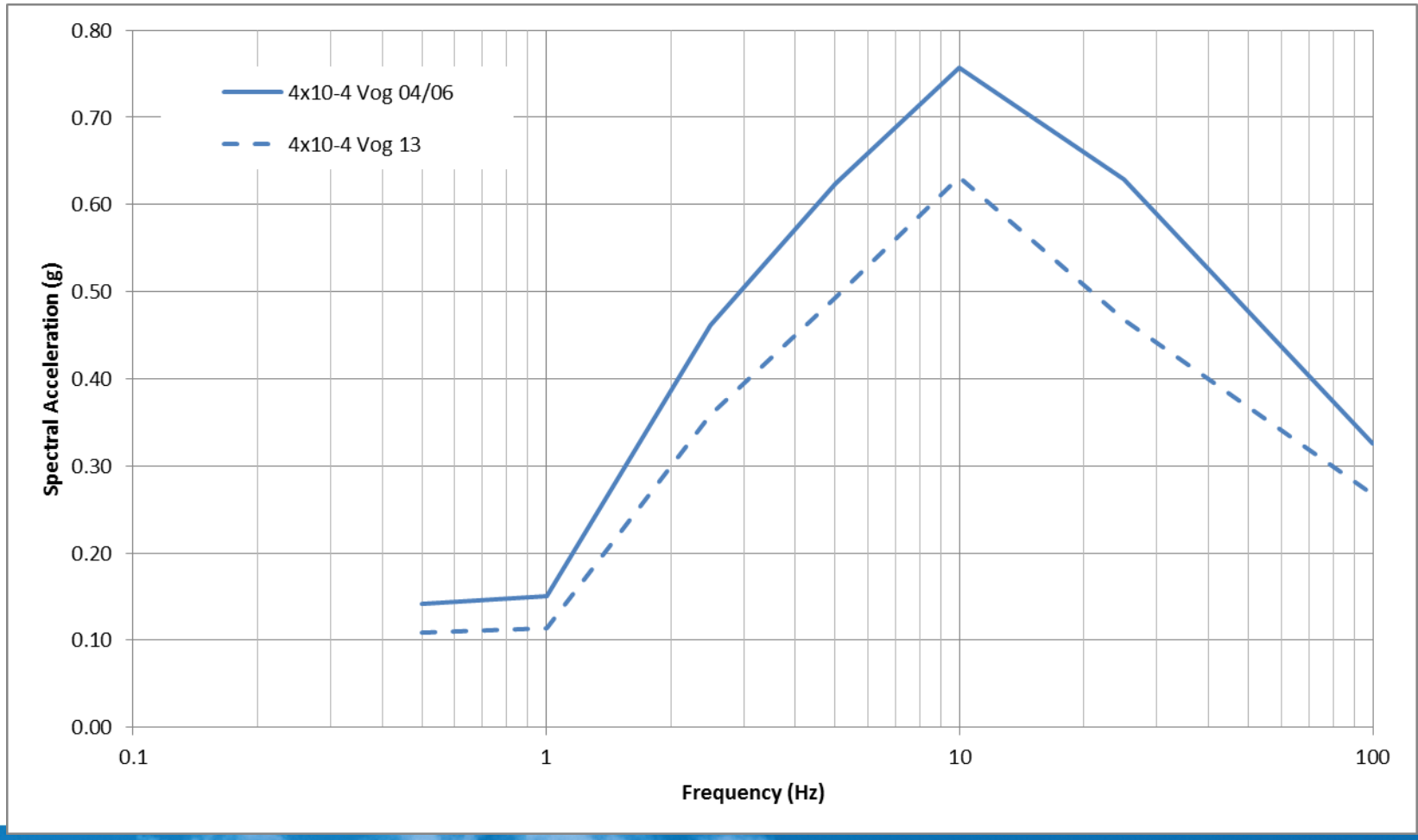
AFE	0.5 Hz	1 Hz	2.5 Hz	5 Hz	10 Hz	25 Hz	PGA
$4x10^{-4}$	-23%	-22%	-24%	-20%	-15%	-26%	-4%



Change in the Vogtle Soil Hazard Curve

- Soil Hazard Reduced 17% to 26% at 4×10^{-4}

AFE	0.5 Hz	1 Hz	2.5 Hz	5 Hz	10 Hz	25 Hz	PGA
$4x10^{-4}$	-23%	-24%	-22%	-21%	-17%	-26%	-18%



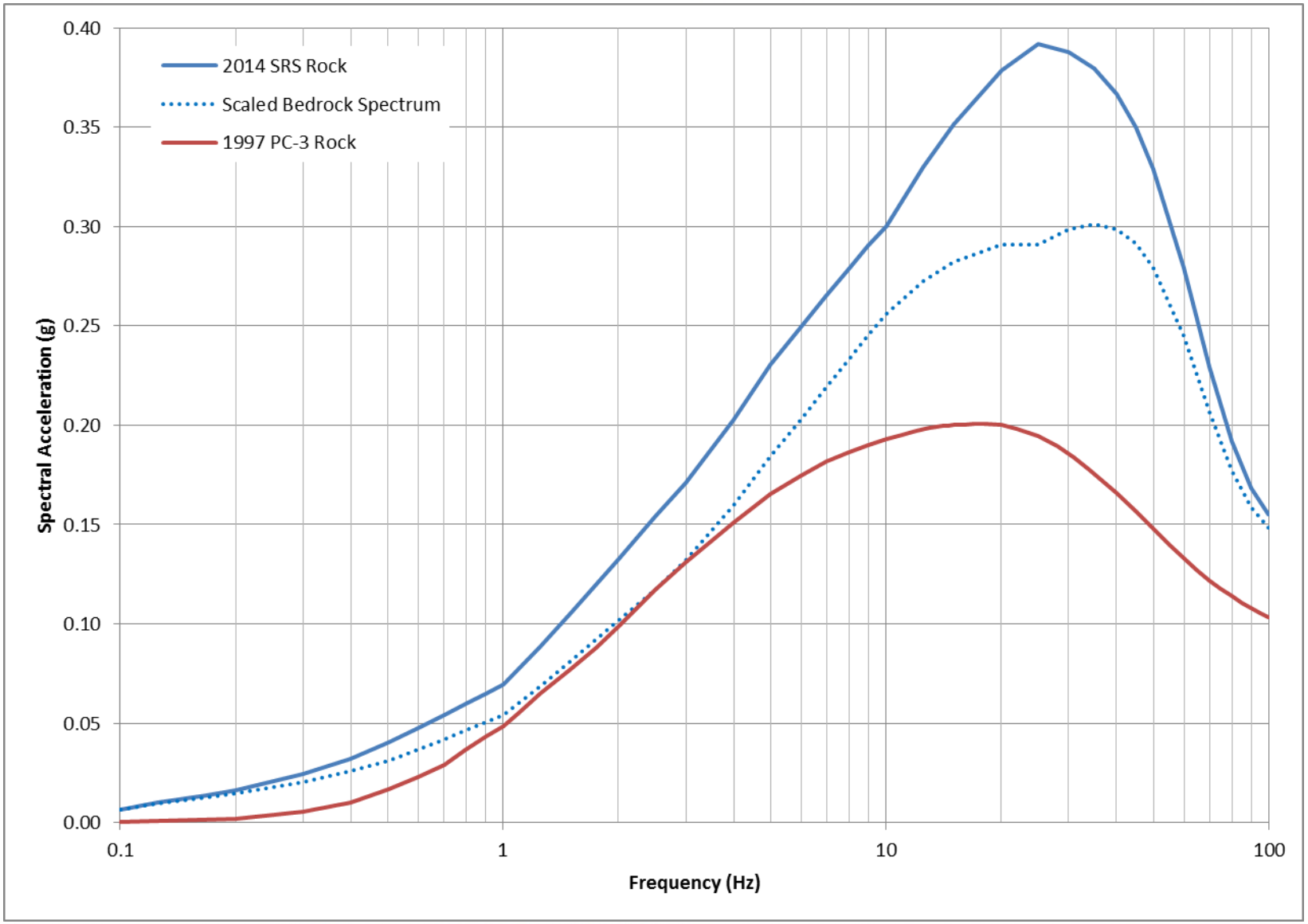
Application of the Vogtle Results to SRS

- Scale 2014 SRS PSHA Results

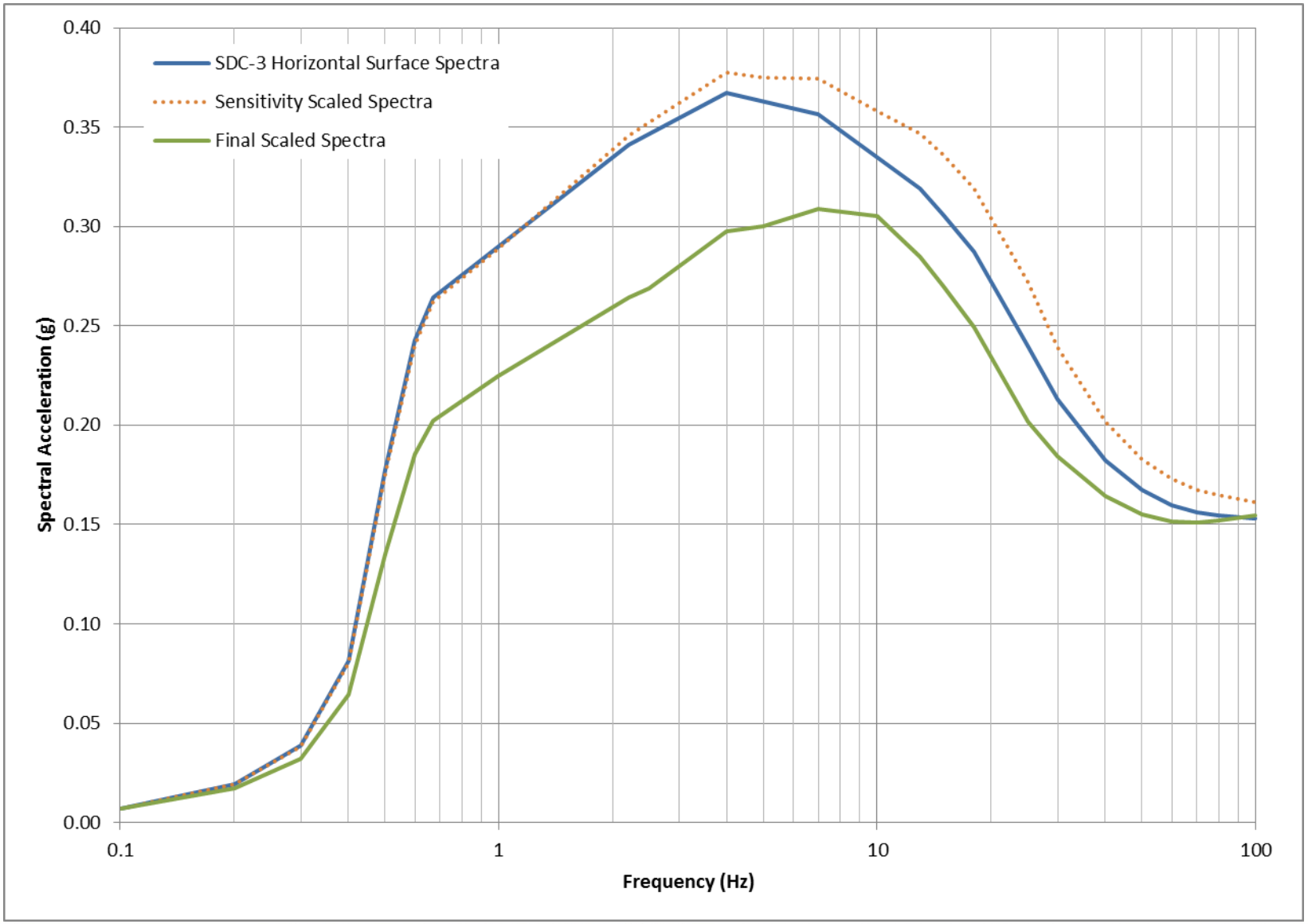
- Rock Spectra
  - Consider the Effects of EPRI 2013 (Vogtle)

- Surface Spectra
  - Consider the Effects of the 1×10^{-2} and 1×10^{-3} AFEs
  - Consider the Effects of EPRI 2013 (Vogtle)

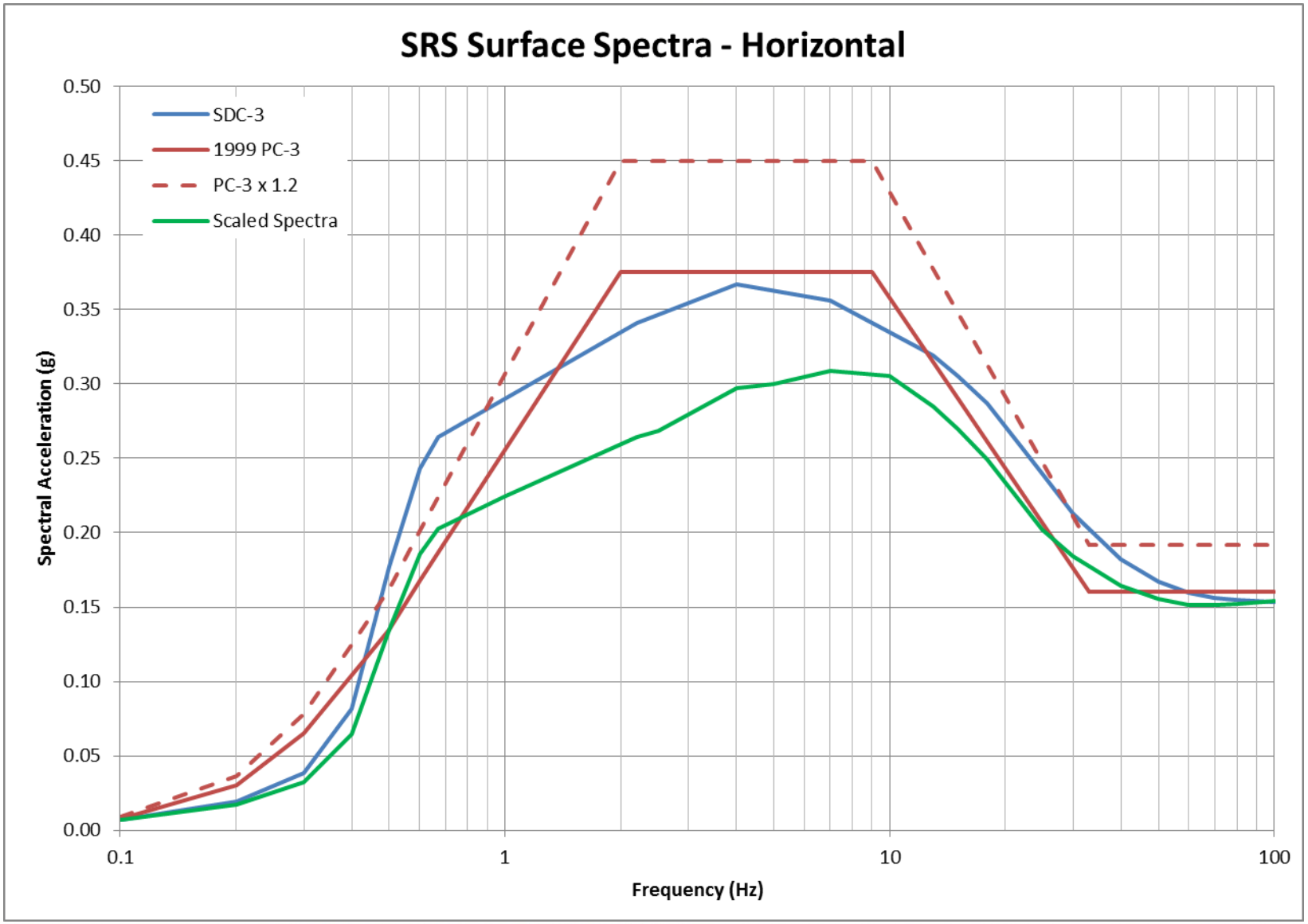
SRS Scaled Rock Spectrum



SRS Scaled Surface Spectra



Comparison of Scaled Spectra with Current Design Spectra



Conclusions

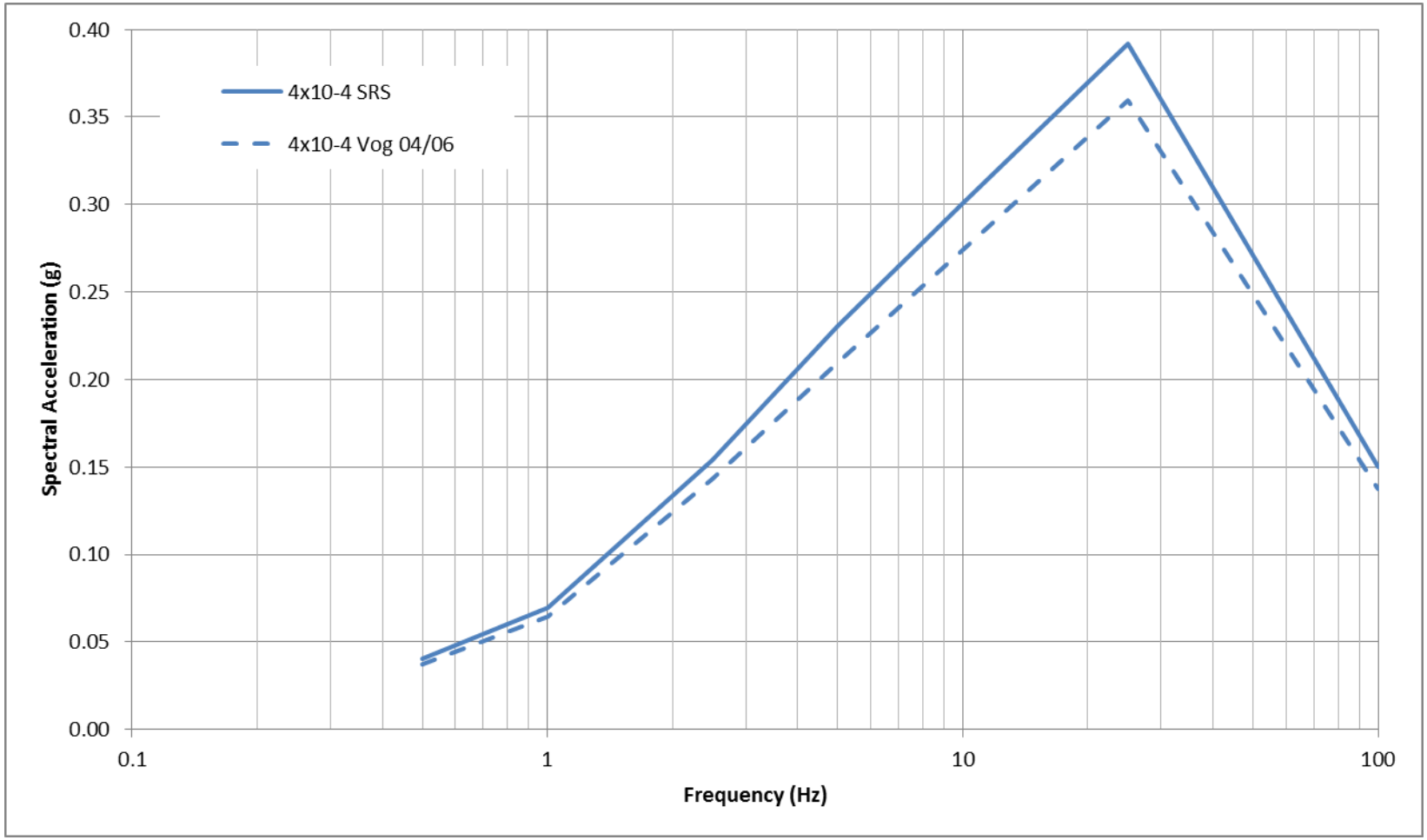
- Scaled Spectra is Approximate to Current SRS Design Requirements
- Load Factor (1.2x) Bounds the Scaled Spectra
- NGA-East GMM

Acknowledgements

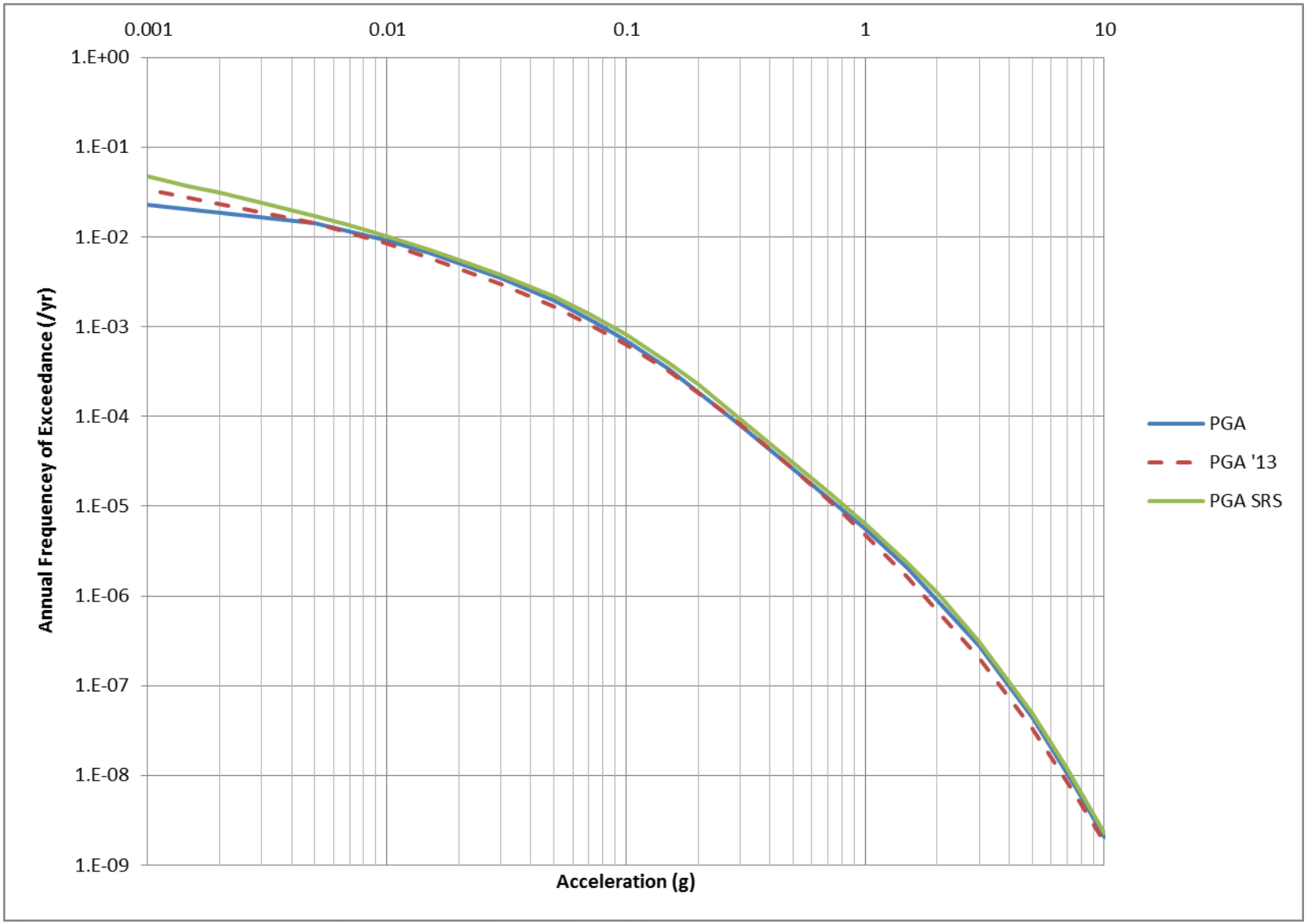
- Brent Gutierrez – DOE-SR
- Jay Amin – SRNS
- Shawn Carey – SRNS
- Don Moore – Southern Company

Backup Slides

Vogtle – SRS Rock UHRS Comparison



Rock Hazard Comparison



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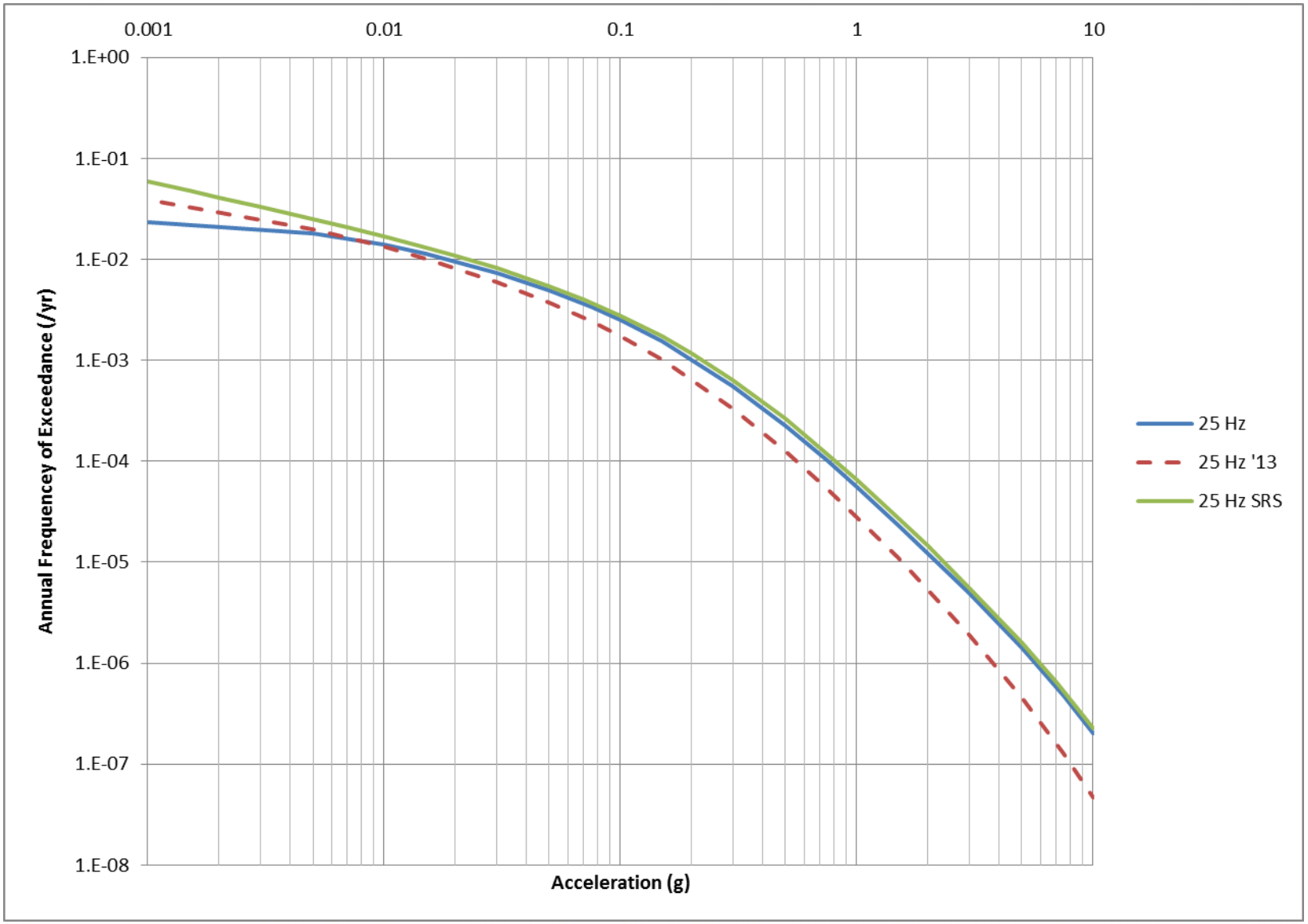

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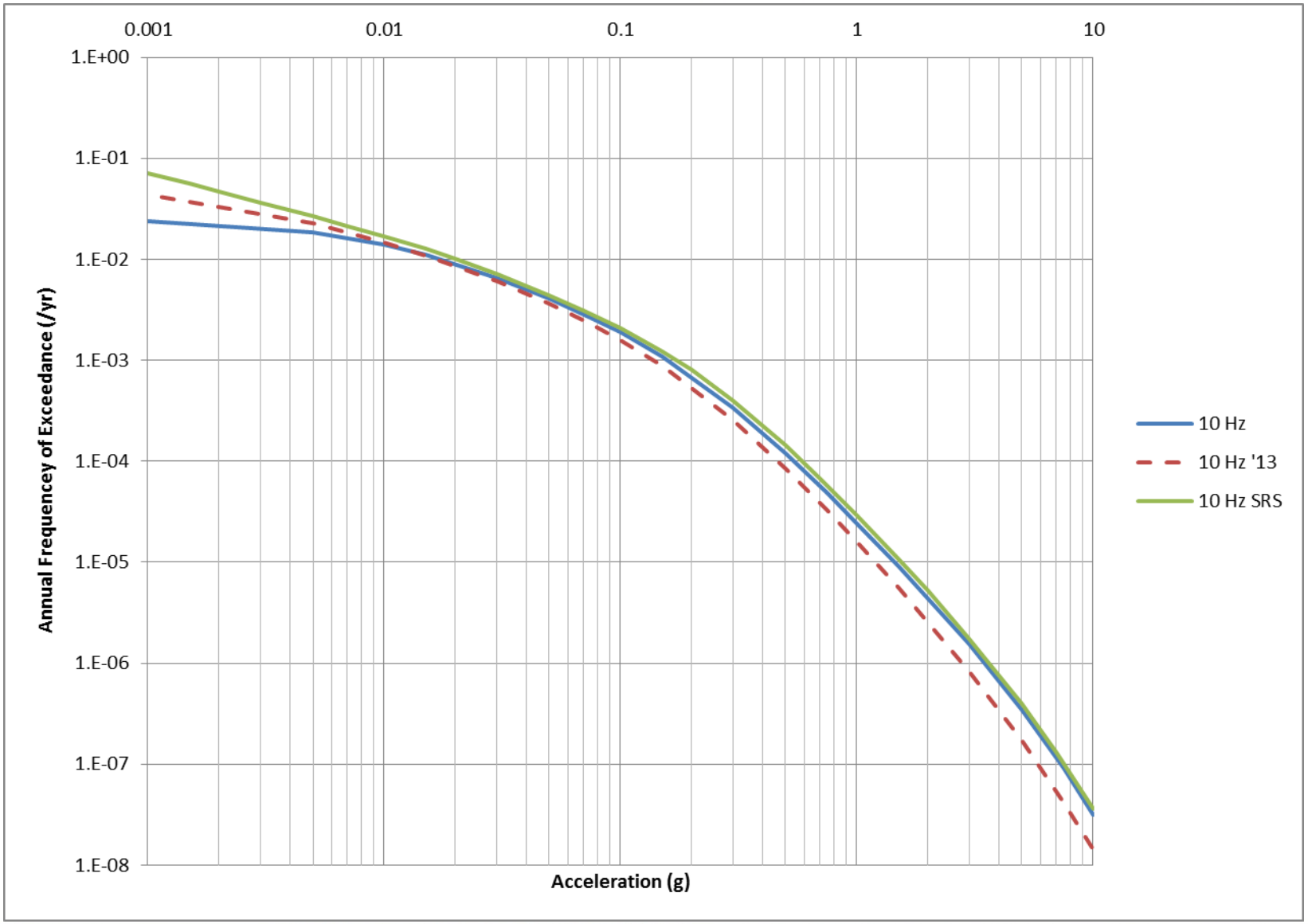

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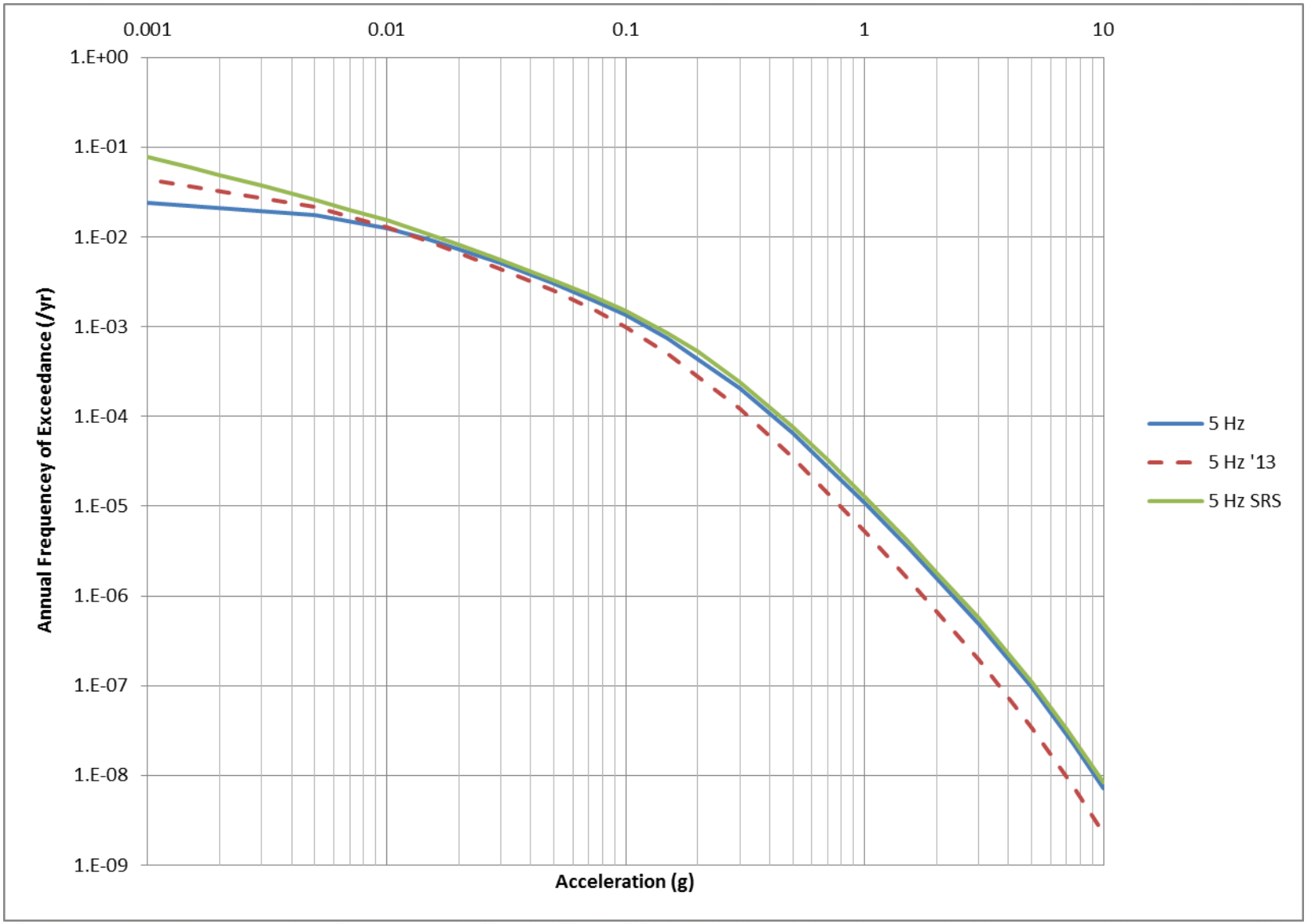

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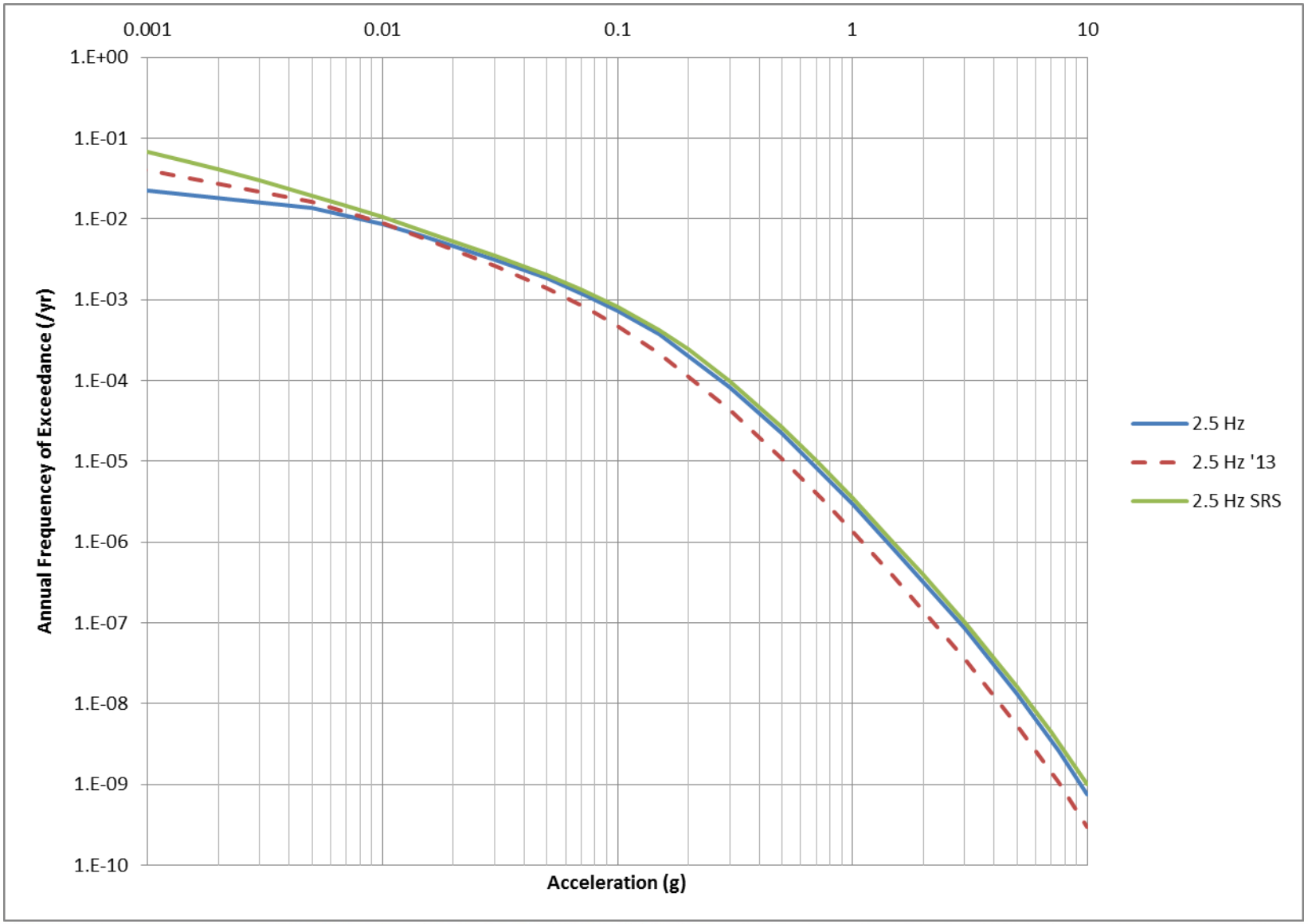

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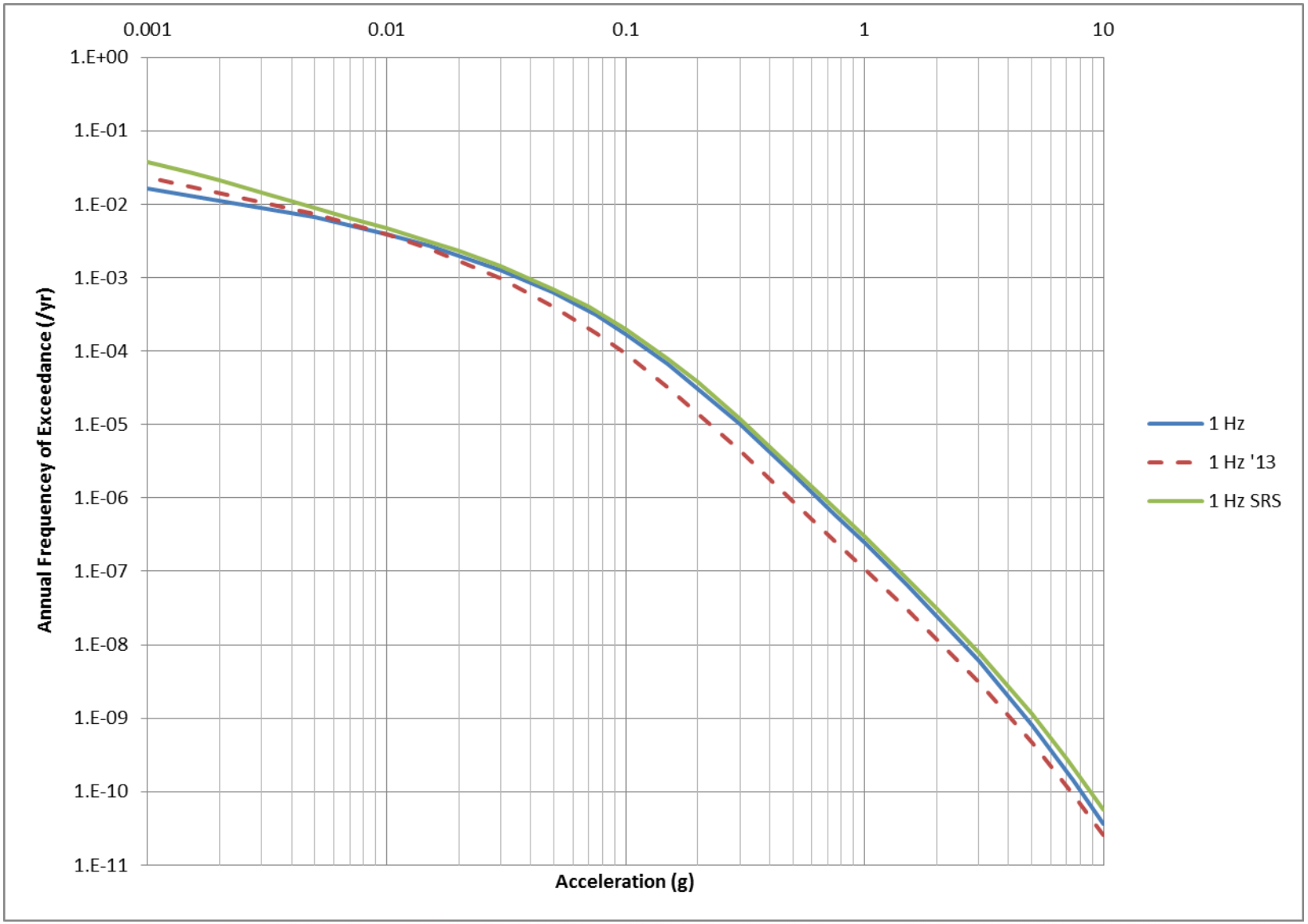
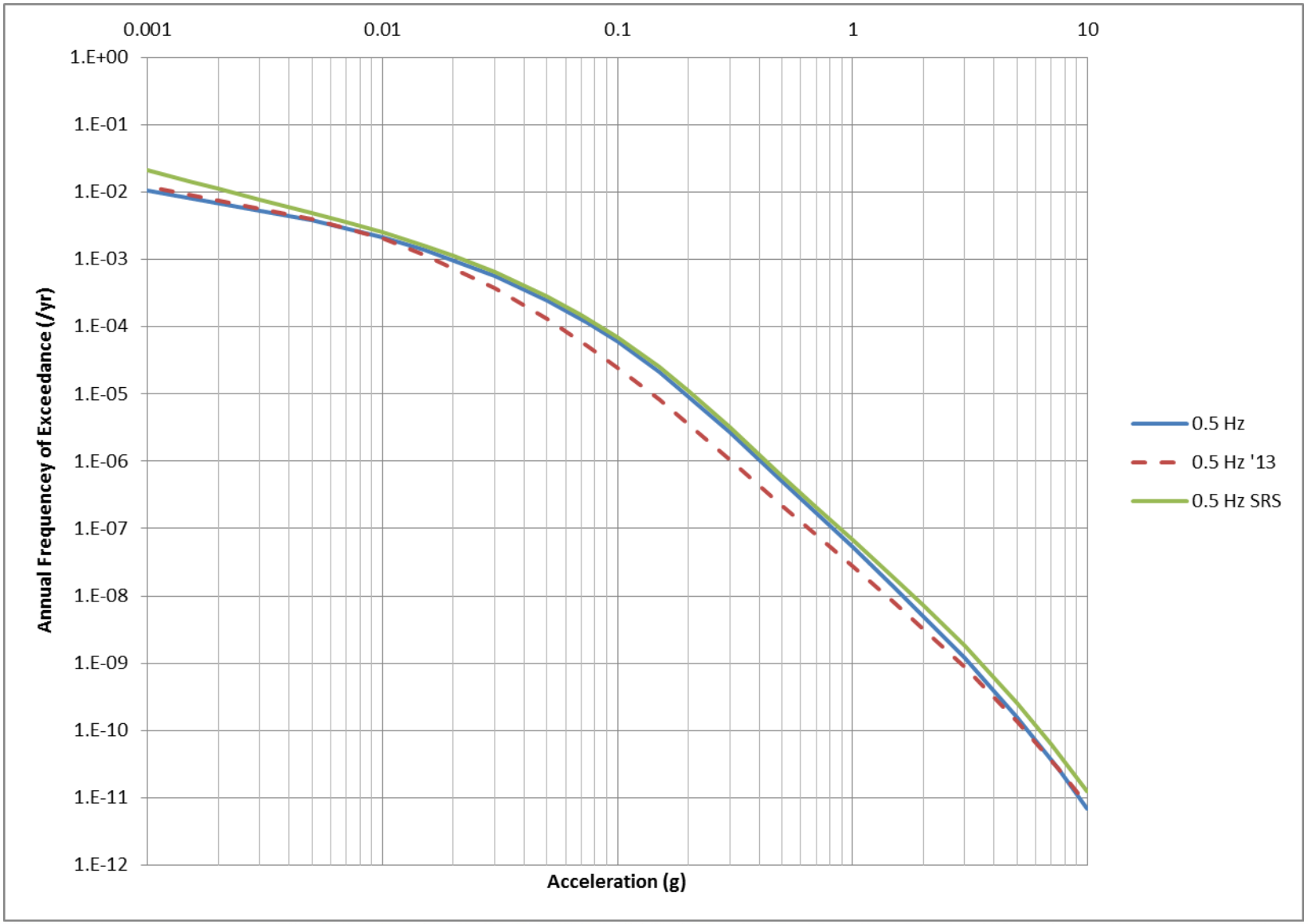
Rock Hazard Comparison