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# **RIC 2025**

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**Supporting International Coordination on Nuclear Technologies and Licensing Activities**

# **NRC/NEA Workshop on Seismic Input Motion Development for Analysis and Design of Nuclear Installations**

*Structural, Geotechnical, and Seismic Engineering Branch  
Division of Engineering, Office of Nuclear Regulatory Research*



*OECD/NEA Committee on the Safety of Nuclear Installations (CSNI) Activity Proposal Sheet (CAPS)*  
*Working Group on Integrity and Ageing of Components and Structures (WGIAGE)*  
**CAPS WGIAGE(2024)-1**

## Workshop on Seismic Input Motion Development (SIMD) for Analysis and Design of Nuclear Installations

**Location:** NRC Headquarters

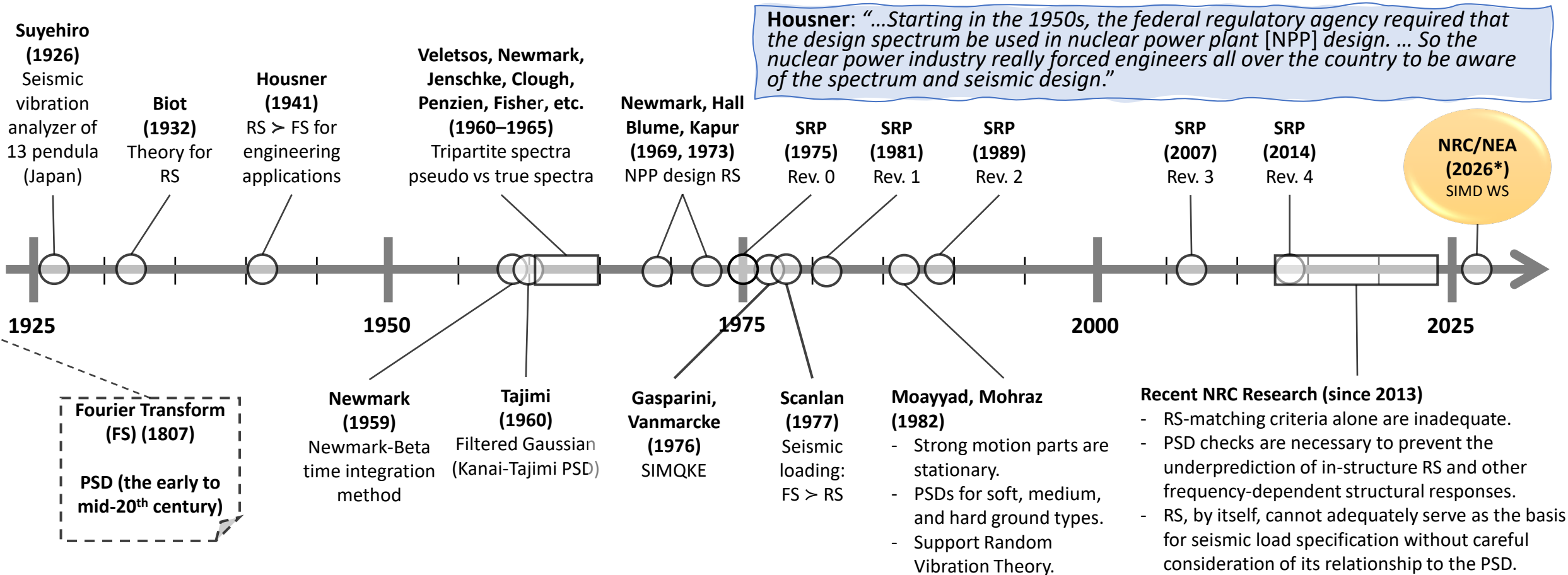
**Date:** May 2026 (dates to be determined)

**Introduction:** The international SIMD workshop will bring together the seismological and the structural engineering communities for a focused discussion of SIMD-related topics and their impact on seismic safety of both advanced reactor designs and large light-water reactors. The workshop will address recent research findings indicating that power spectral density (PSD) functions are necessary for response spectra (RS) to adequately represent the intended input motions. The workshop will cover three main topics: (1) historical and recent developments and applications of RS and PSD in seismic engineering, (2) near-term considerations for SIMD in seismic analysis and design, and (3) long-term research and development needs for robust measures to address the full spectrum of seismic engineering tasks—including seismic hazard analysis, seismic load specification, and seismic analysis, design, and risk assessment. The workshop will promote international uniformity and efficiency, particularly in supporting advanced reactor designs for which licenses may be pursued in multiple countries. Many of these designs involve innovative systems such as seismic isolators, graphite fuel pebbles, and water pools and other fluid systems that behave in the nonlinear regime during strong earthquakes.

## Leading and Supporting Organizations for the SIMD Workshop



## A Sample of RS and PSD Development in Modern Seismic Engineering

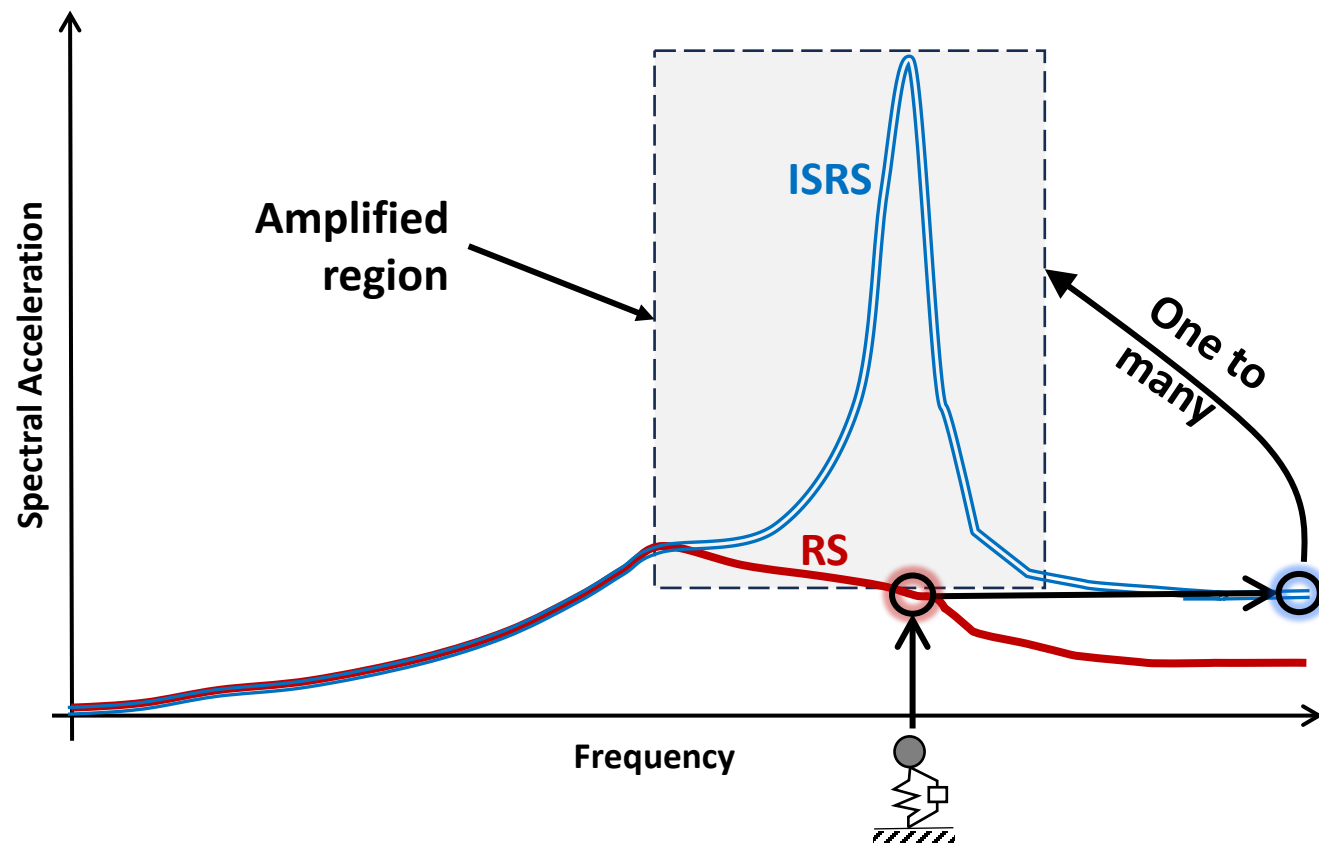


SRP: Standard Review Plan, WS: workshop

**\*2026 is the centennial of the RS concept proposed by Prof. Suyehiro in 1926.**



## Technical Background: RS-Matching Criteria Alone Are Inadequate



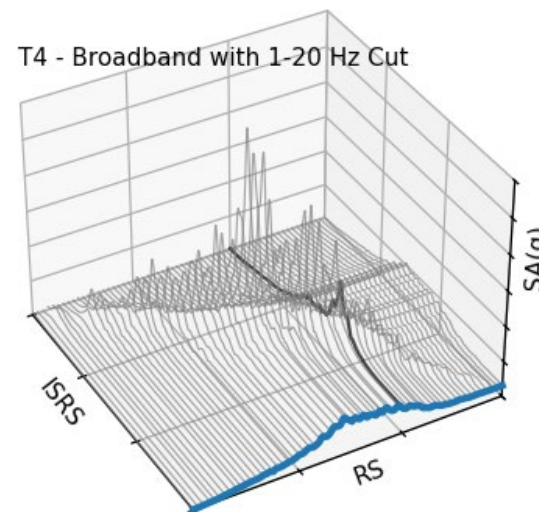
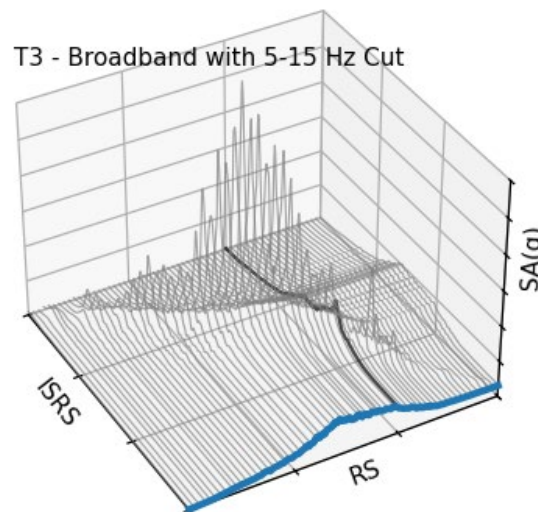
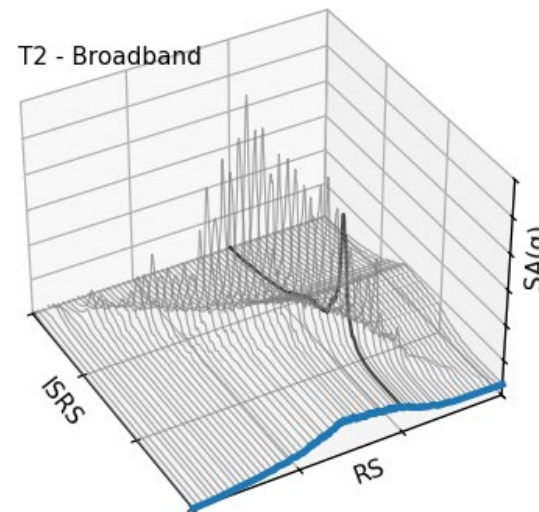
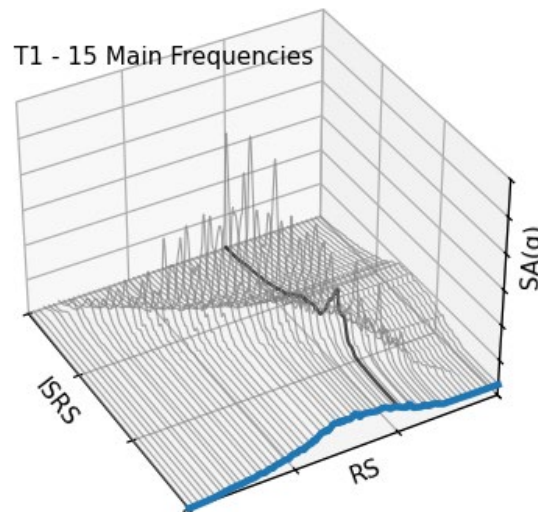
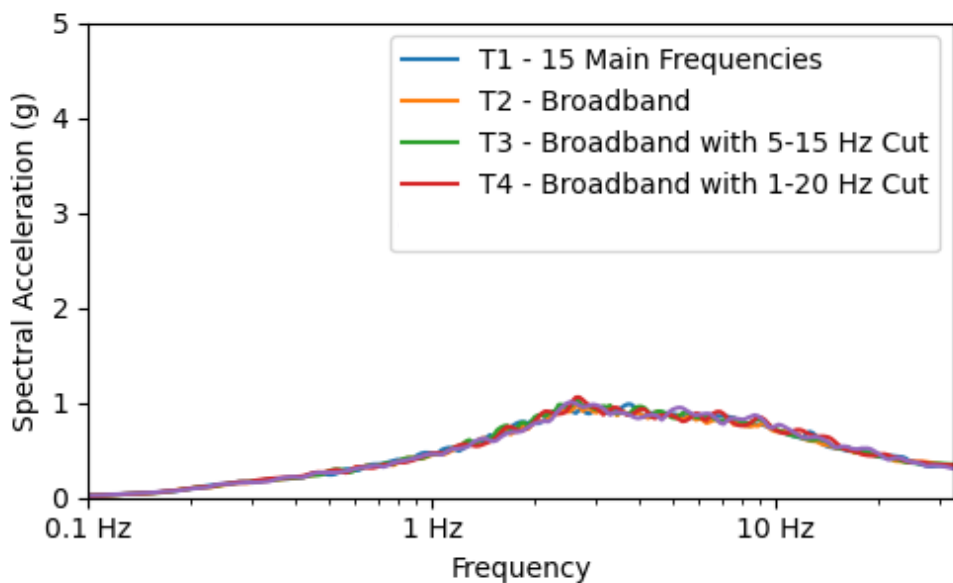
ISRS: In-Structure Response Spectra

ZPA: Zero Period Acceleration on RS or ISRS

The input spectral value at the oscillator frequency is the ZPA on the ISRS of the oscillator response (mathematically,  $RS \equiv ISRS$  ZPA).

ISRS in the amplified region is not guaranteed by the input RS/ISRS ZPA. The same input RS/ISRS ZPA can correspond to vastly different ISRS curves (beyond the expected variation due to phase angle differences), depending on how the seismic design time histories are generated.

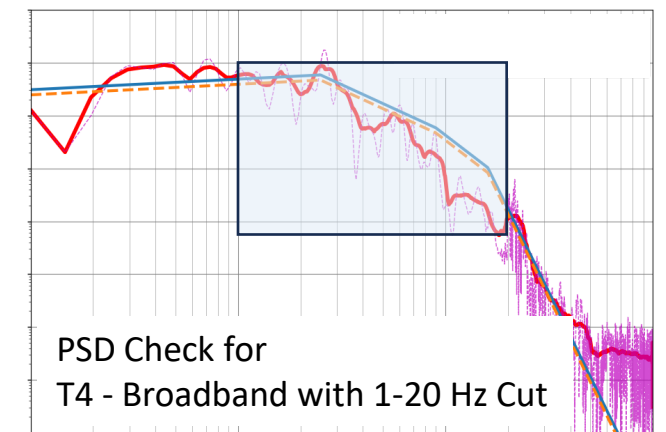
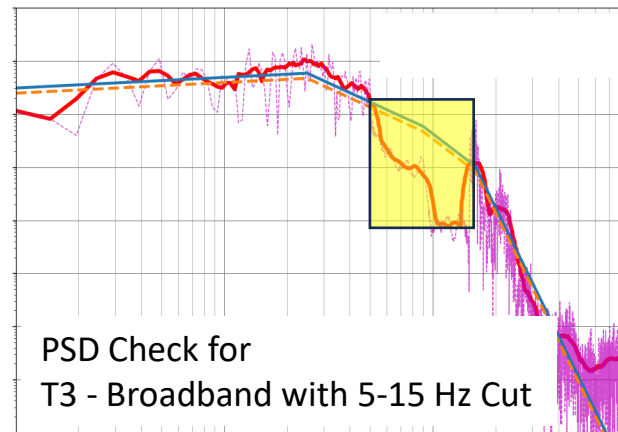
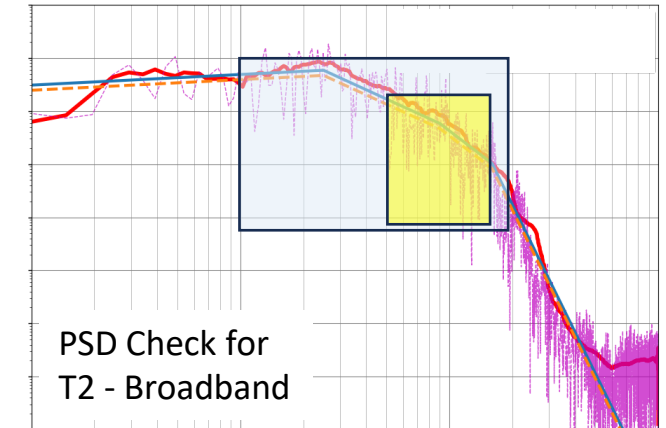
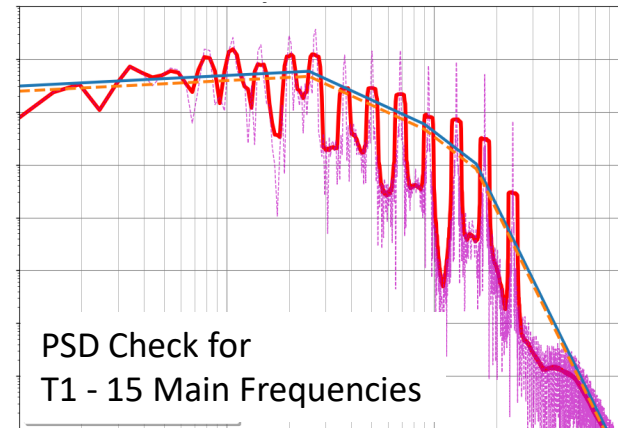
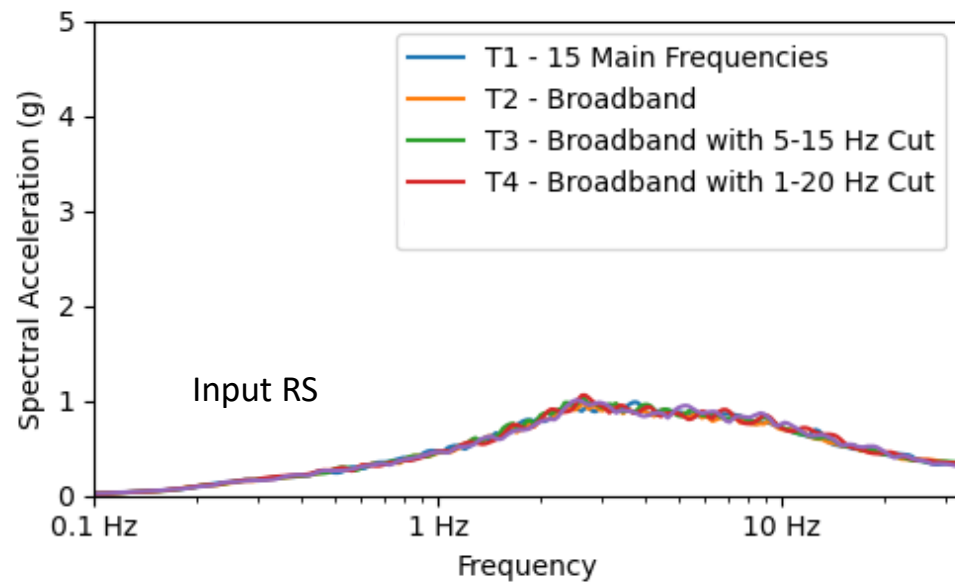
## Examples of Very Similar Input RS Leading to Vastly Differing Oscillator ISRS







## PSD Checks Can Identify Power Deficiencies Which Cause the Underestimation of ISRS and Other Seismic Demands







## Summary

- RS-matching criteria alone are inadequate.
- PSD checks are essential to avoid underestimating ISRS and other frequency-dependent structural responses.
- Underestimated seismic demands can result in unsafe designs.
- RS alone cannot adequately serve as the basis for seismic load specification without carefully considering its relationship to the PSD.
  - This limitation also applies to response spectrum analysis, which relies on PSD—either implicitly or explicitly—for correlation coefficient calculations.

## NRC/NEA Workshop on Seismic Input Motion Development for Analysis and Design of Nuclear Installations

*NRC Headquarters, May 2026*

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