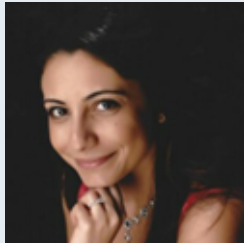


Next-Generation Ground Motion **S**imulation, **V**alidation, and **U**tilization (GM-**SVU**) Technical Activity Group (TAG)



Sanaz Rezaeian (USGS), Scott Callaghan (SCEC),
Chukwuebuka C. Nweke (USC), Farzin Zareian (UCI),
Maha Kenawy (Oklahoma State University)

September 1, 2026

SCEC Annual Meeting, Palm Springs, California

USGS: U.S. Geological Survey
USC: University of Southern California
UCI: University of California, Irvine

TAG Objectives

- **Previous GMSV TAG (2011 – 2024):** ... develop and implement, via collaboration between ground motion modelers and engineering users, testing and rating methodologies for the use of ground motion simulations in engineering applications.
 - Focus on validation (consistency with observations) of simulation methods
 - Not on verification (code debugging)
 - Not on evaluation of individual simulated records, but “vetted” sets requested



TAG Objectives

- **Previous GMSV TAG (2011 – 2024): ...**
 - Started as Coordinating Proposals by Individual PIs
 - Finished with Multi-PI Proposals
 - Learned Validation is Application Specific



PI: Principal Investigator

TAG Objectives

- **Previous GMSV TAG (2011 – 2024): ...**

Validation exercises are most effective when we:

- provide guidance for engineers on simulation methods suitable for use “now”
- inform ground motion modelers how to improve their methods for “future” use





TAG Objectives

- Previous GMSV TAG (2011 – 2024): ...

SCEC Award #2114

- 2024 EQS Synthesis Paper (Rezaeian, Stewart, Luco, Goulet)
– A Community Product



EQS: Earthquake Spectra



TAG Objectives

- **New GM-SVU TAG (2026+):** ... building on a decade of *Validation* work, the new GM-SVU TAG advances the earlier SCEC GMSV effort from broad coordination toward tangible, community-tested products: validated datasets, standardized protocols, and clear utilization guidance.

Strengthen the coordination → collaboration

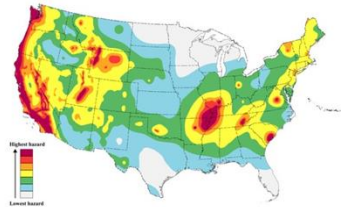


Deliverables: Framework & Guidelines

Guidelines for use of simulations in Probabilistic Seismic Hazard Analysis (PSHA)



2029 USGS NSHM?



Simulation Selection & Improvement
Curate an initial documented dataset and define pathways for iterative refinement

PSHA Validation & Utilization

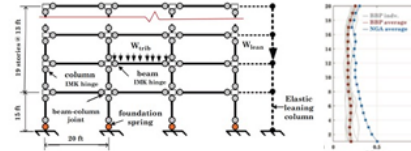
Application-specific metrics, benchmark studies, and draft guidance



UGMS Data Access Tool
Provides site-specific MCER response spectra for the Los Angeles region per ASCE 7-16

RHA Validation & Utilization

IMs, Structural response, and code relevant benchmarks



Trusted, Application-Ready Resources

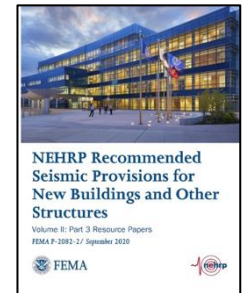
Validated simulations, validated protocols, PSHA/RHA guidance

Validation findings feed targeted simulation improvement and re-validation

Guidelines for use of simulations in nonlinear Response History Analysis (RHA)



2032 NEHRP Prov?





How Do We Get There?

GM-SVU TAG Goals – Year 1:

1. Community-informed research priorities
2. An initial vetted set of simulation dataset (CyberShake)
3. Draft guidelines for PSHA applications
4. Draft guidelines for RHA applications (bridge & building examples)
5. Define feedback framework for iterative simulation improvements and re-validation in subsequent years

Year 1 Pathway



Community
Survey
Open





13NCEE Workshop Key Outcomes

Participation:

- 78 participants from a broad range of disciplines spanning research & practice

Presentations & Panel Discussions:

- Validation: Reviewed past efforts from qualitative waveform comparisons to quantitative validation metrics → SCEC GMSV Toolkit → Remaining research needs
- Simulation: Expand simulations to updated CyberShake & BBP to AI-enables workflows.
- Utilization: Advance use in both PSHA & RHA applications.

Community Survey Results:

- Moderate confidence, but sees a path to broader application
- Highest priority: engineering guidance & validation
- Scientific priorities closely tied to engineering needs



Visit the Poster

Next Generation Ground Motion Simulation, Validation, and Utilization (GM-SVU) in Seismic Hazard and Engineering Applications: A New SCEC Technical Activity Group

Maha Kenawy, Sanaz Rezaeian, Scott Callaghan, Chukwuebuka C. Nweke, & Farzin Zareian

Group A, Poster #239
Ground Motions (GM)

