



# **National Earthquake Hazards Reduction Program**

## **Briefing for Central United States Earthquake Consortium**

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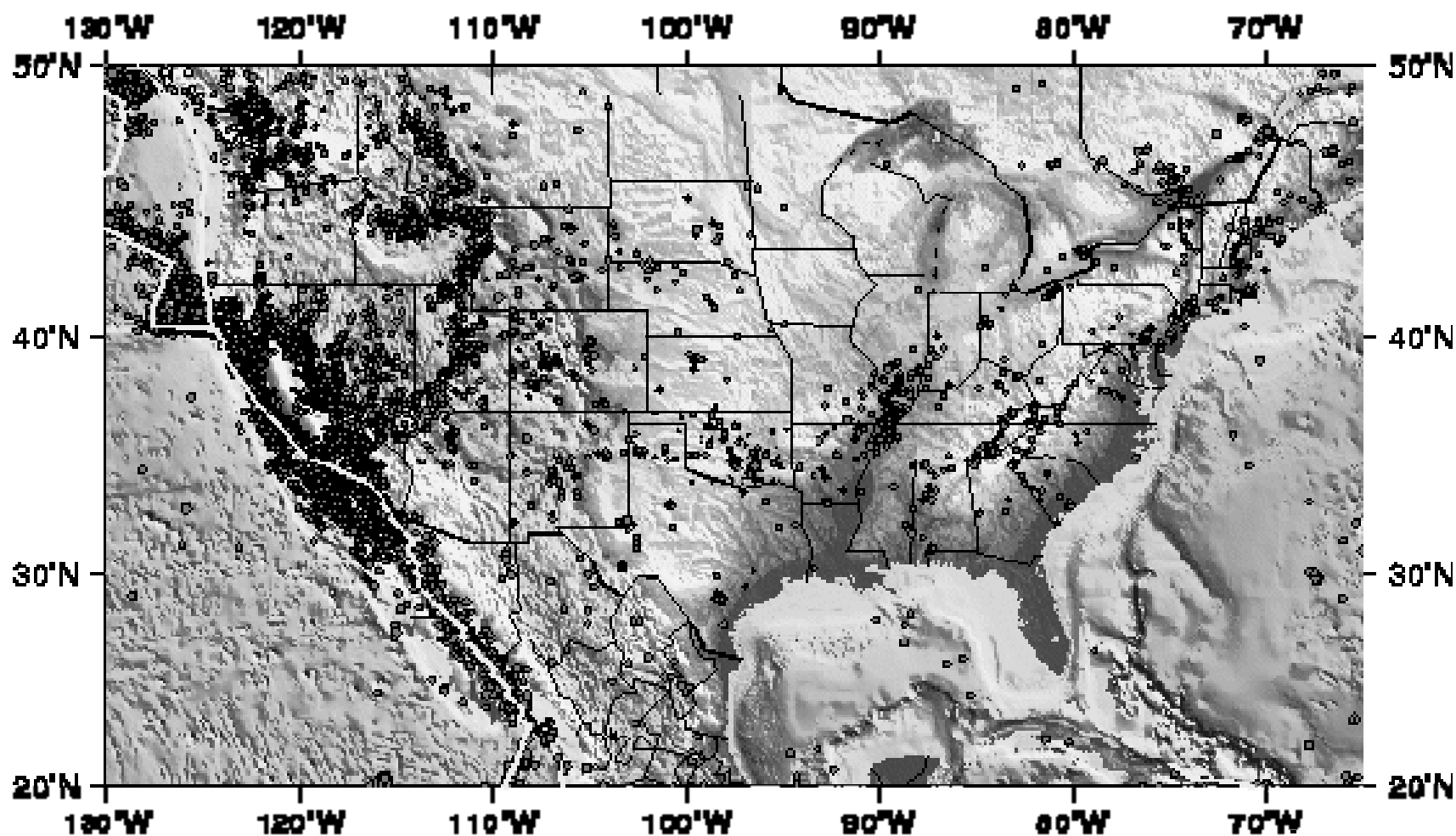


## History and Overview

- Earthquake Hazards Reduction Act of 1977 (P.L. 95-124) established NEHRP
- NEHRP is the federal government's coordinated long-term nationwide program to reduce the risks of life and property in the United States resulting from earthquakes.
- NEHRP authorizes funding for four principal agencies:
  - Federal Emergency Management Agency
  - National Institute of Standards and Technology
  - National Science Foundation
  - United States Geological Survey
- The NEHRP budget was about \$115 million in FY 2004.
- Congress reviews and reauthorizes NEHRP typically every 2 or 3 years.

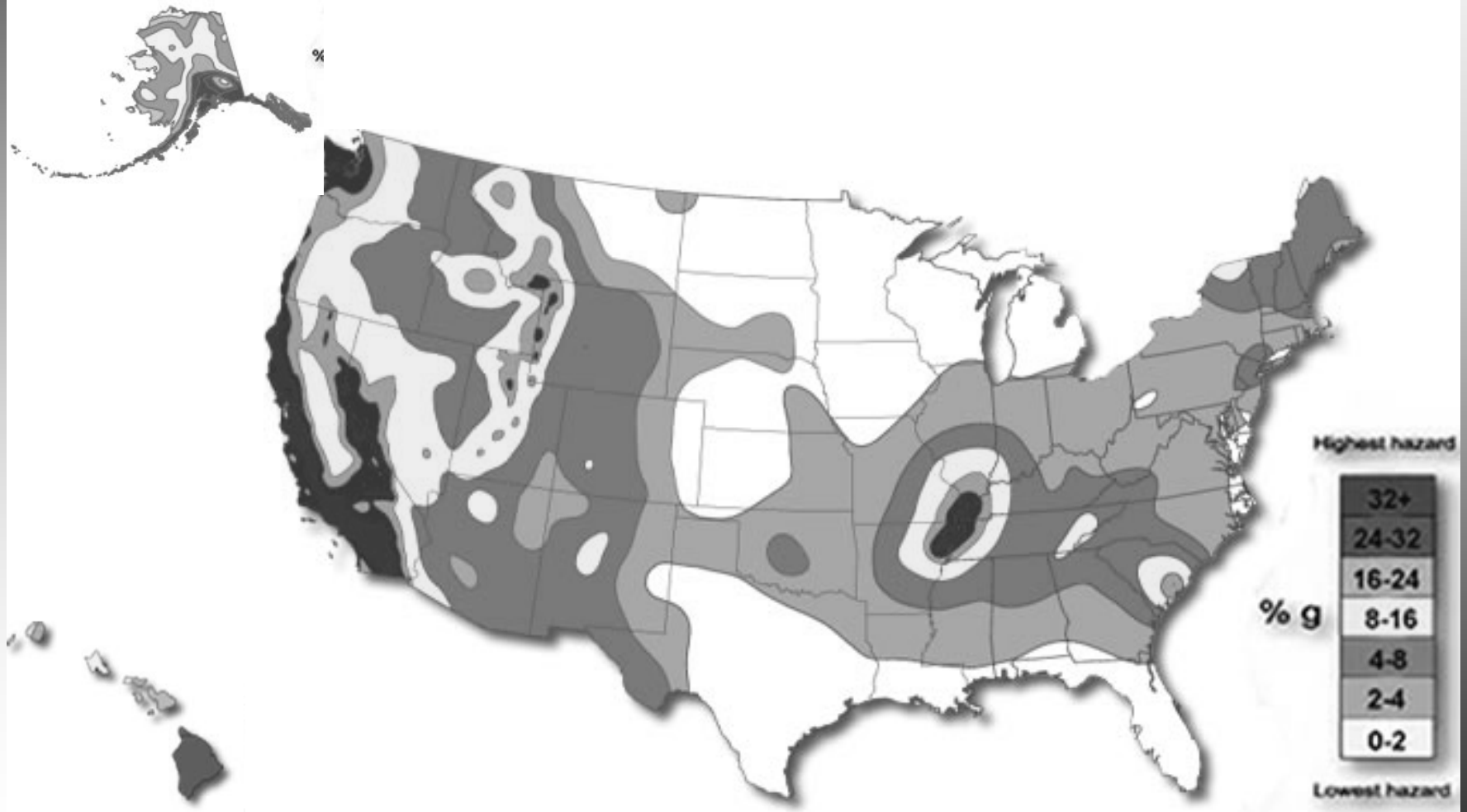


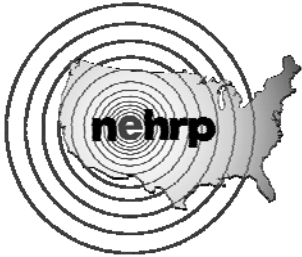
# Seismicity of the United States





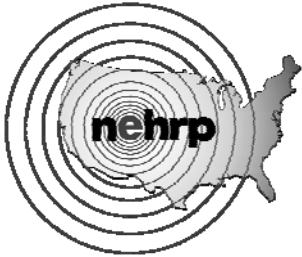
# Earthquake Ground Shaking Hazards





## Earthquake Loss Estimates

- Average financial loss associated with U.S. earthquakes is \$10 billion per year for buildings, transportation networks, and other lifelines systems, and business disruption.
- Potential loss estimates of a large earthquake in a major U.S. urban area now approach \$200 billion.
- Slow implementation of new mitigation technologies, combined with continued widespread development in areas of high seismic risk, has resulted in a rapid and steady increase in societal vulnerability to a major earthquake.
- Ninety percent of tsunamis are generated by earthquakes, and most tsunamis that have caused severe devastation have been earthquake generated.
- An earthquake along the 680-mile undersea fault known as the Cascadia subduction zone off the coast of Washington, Oregon, and northern California could generate a tsunami similar to the northern coast of Sumatra and would give only 10-20 minute warning time to the residents in coastal communities along the Pacific Northwest.



## NEHRP Reauthorization Act of 2004

- Congress completed thorough two-year review of NEHRP, resulting in enactment of P.L. 108-360, signed into law October 25, 2004. These include hearings held by the House Science Research Subcommittee and the Senate Space, Science, and Transportation Subcommittee.
- Congress recognized that slow implementation of new mitigation technologies, combined with continued widespread development in areas of high seismic risk, has resulted in a rapid and steady increase in societal vulnerability to a major earthquake. Potential loss estimates of a large earthquake in a major U.S. urban area now approach \$200 billion.
- Congress reauthorized NEHRP for five years (FY 2005 to FY 2009) with an average authorized budget of \$180 million per year, an increase of about \$75 million per year.



## NEHRP Authorized Budgets (\$M)

Agency/Initiative	FY 2005	FY 2006	FY 2009
FEMA	21.0	21.6	23.6
NIST	10.0	11.0	14.6
NSF	38.0	39.1	42.8
NEES (O&M)	20.0	20.4	21.9
USGS	77.0	84.4	88.9
ANSS (not less than)	(30.0)	(36.0)	(36.0)
NEHRP Total	166.0	176.5	191.8



## NEHRP Strategic Priorities

- Congress strongly endorsed the priorities identified in the 2001-2005 NEHRP Strategic Plan, developed in partnership with the broad stakeholder community from the private sector, state and local governments, academia.
- The authorized increases were well thought out and directed at specific initiative areas that address several key national needs. These include:
  - Completing the Advanced National Seismic System (ANSS) by USGS
  - Developing, operating, and maintaining the Network for Earthquake Engineering Simulation (NEES) by NSF
  - Implementing an R&D roadmap to close the “research-to-practice” gap by NIST
  - Operating and maintaining the Global Seismographic Network (GSN) by USGS and NSF





## Mandated Program Activities

- Develop effective measures for earthquake hazards reduction
- Promote the adoption of earthquake hazards reduction measures by Federal, State, and local governments, national standards and model code organizations, architects and engineers, building owners, and others with a role in planning and constructing buildings, structures, and lifelines through:
  - grants, contracts, cooperative agreements, and technical assistance;
  - development of standards, guidelines, and voluntary consensus codes for earthquake hazards reduction for buildings, structures, and lifelines;
  - development and maintenance of a repository of information, including technical data, on seismic risk and hazards reduction
- Improve the understanding of earthquakes and their effects on communities, buildings, structures, and lifelines, through interdisciplinary research that involves engineering, natural sciences, and social, economic, and decisions sciences
- Develop, operate, and maintain an Advanced National Seismic Research and Monitoring System, the George E. Brown, Jr. Network for Earthquake Engineering Simulation, and the Global Seismographic Network.



## NEHRP Lead Agency

- Congress recognized that NIST had a critical role to play and was best suited to provide leadership and coordination for NEHRP.
- P.L. 108-360 designates NIST as the lead agency for NEHRP, transferring responsibility from FEMA which had that role from the program's inception.
- The law assigns NIST responsibilities for the overall planning, coordination, and management of NEHRP, with several new responsibilities that were not carried out previously.
- The law also assigns NIST significant new R&D responsibilities to close the “research-to-practice” gap and accelerate the use of new earthquake risk mitigation technologies based on the earth sciences and engineering knowledge developed through NEHRP efforts.
- Congress authorized \$10 million for NIST in FY 2005, \$11 million in FY 2006, increasing to \$14.6 million in FY 2009.



## Agency Roles and Responsibilities

- **FEMA** is responsible for emergency response and management, estimation of loss potential, and implementation of mitigation actions.
- **NIST** conducts applied earthquake engineering research to provide the technical basis for building codes, standards, and practices, and provides the NEHRP lead agency function.
- **NSF** conducts basic research in seismology, earthquake engineering, and social, behavioral, and economic sciences and operates the Network for Earthquake Engineering Simulation (which includes the tsunami wave basin research facility and supporting tsunami research).
- **USGS** operates seismic networks, develops seismic hazard maps, coordinates post-earthquake investigations, and conducts applied earth sciences research (which includes tsunami research and risk assessment).
- **NSF and USGS** jointly support the Global Seismographic Network (GSN)—the main facility for pinpointing earthquakes in real time.



## Lead Agency Functions

- The NEHRP Lead Agency oversees the planning, management, and coordination of the program.
- Chair the Interagency Coordinating Committee (ICC)—composed of the directors of FEMA, USGS, NSF, OSTP, and OMB.
- Provide coordination by working with the ICC, which is required to meet no less than 3 times a year, to:
  - develop, not later than 6 months after enactment, and update periodically a strategic plan that establishes goals and priorities for the program, and a detailed management plan to implement the strategic plan;
  - provide guidance to the program agencies in preparation of annual budgets, and develop and submit annually a coordinated interagency budget that ensures appropriate balance among the program activities and in accordance with the strategic and management plans; and
  - transmit—at the time of the President's budget request to Congress—annual report with consolidated program priorities, budgets, and results, including an assessment of program effectiveness.



## Lead Agency Functions (2)

- Establish and support operation of an Advisory Committee on Earthquake Hazards Reduction with members to be selected and appointed by the NIST Director. The Advisory Committee is required to:
  - Submit a report to the NIST Director—not later than 1 year after enactment and at least once every 2 years thereafter—on its findings related to trends and development, program effectiveness, and the management, coordination, and implementation of the program.
  - Report on its recommendations for ways to improve the program.
- Ensure that the Program includes the necessary steps to promote the implementation of earthquake hazard reduction measures by Federal, State, and local governments, national standards and model building code organizations, architects and engineers, and others with a role in planning and constructing buildings and lifelines.
- Request the assistance of Federal agencies other than the program agencies, as necessary to assist in carrying out the law.



## Plan for NEHRP Coordination Committee

- NIST has proposed forming a Program Coordination Committee to:
  - Establish framework for interagency coordination
  - Move the program forward in the absence of new funding for the lead agency function
- The proposal is currently under consideration by the NEHRP agencies
- NEHRP Director
  - Responsible for executive leadership, coordination and carrying out duties assigned to NIST by Public Law 108-360.
- Program Coordinator for Earthquake Risk Mitigation
- Program Coordinator for Earthquake Sciences
- Program Coordinator for Earthquake Engineering
- Program Coordinator for Earthquake Emergency Management and Social Sciences
- NEHRP Secretariat
  - ICC, Advisory Committee, NEHRP Executive Committee, Program Coordination Committee, and ICSSC.



## **“Research-to-Practice” Gap**

- NEHRP Strategic Plan identified a major technology transfer gap that limits the adaptation of basic research knowledge into practice.
- At the request of NIST, the Applied Technology Council developed an R&D roadmap in 2003 to address the “research-to-practice” gap.
- The R&D roadmap, developed by leading industry and other stakeholders, identified the need for \$6.5 million in sustained annual funding for its implementation.



## R&D Roadmap Goal and Outcome

- **Goal:** To develop more efficient, effective, and technically reliable practice for earthquake engineering design and construction.
- **Outcome:** To realize—in real life and in real buildings and lifelines—the potential of the significant investment the nation has made in developing new information and knowledge through research over many years.
  - Better earthquake safety
  - Adequate post-earthquake functioning
  - More economy in construction
- The R&D roadmap provides a framework through which the practicing engineering professions can form a permanent link with the information and research resources of the federal government and universities.
- R&D roadmap implementation is planned to be user- and needs-driven and run like a business enterprise, combining both an extramural component (60%) and an intramural component (40%)





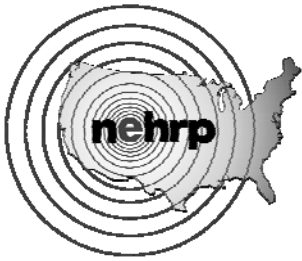
# R&D Roadmap Technical Elements

- ***Subject area: Systematic support of the seismic code development process.***

- Program Element 1      Provide technical support for the seismic practice and code development process.
- Program Element 2      Develop the technical basis for performance-based seismic engineering by supporting problem-focused, user-directed research and development.

- ***Subject area: Improve seismic design and construction productivity.***

- Program Element 3      Support the development of technical resources (e.g., guidelines and manuals) to improve seismic engineering practice.
- Program Element 4      Make evaluated technology available to practicing professionals in the design and construction communities.
- Program Element 5      Develop tools to enhance the productivity, economy and effectiveness of the earthquake resistant design and construction process.



**Thank you**