STATEMENT

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"A REVIEW OF THE NATIONAL EARTHQUAKE HAZARDS REDUCTION PROGRAM (NEHRP)"

Submitted
By

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Introduction

Chairman Bucshon, Ranking Member Lipinski, and Members of the Subcommittee, I am Roy Wright, Deputy Associate Administrator of the Mitigation Directorate at the Department of Homeland Security's (DHS) Federal Emergency Management Agency (FEMA). It is my pleasure to be here today to discuss FEMA's recent earthquake hazards reduction activities through the National Earthquake Hazards Reduction Program (NEHRP).

By including science into the development of building codes and conducting outreach and mitigation, the NEHRP funds state-level efforts to better prepare communities for earthquakes. These actions make the nation more resilient and better able to respond to this increasingly threatening hazard.

The Earthquake Hazard

Of all the natural hazards threatening the United States, earthquakes pose one of the greatest single source risks for casualties and damage in the United States.

According to a 2006 National Research Council (NRC) report[1], 42 States have some degree of earthquake potential and 18 States have areas of high or very high seismicity. More than 75 million people live in urban areas with moderate to high earthquake risk.

Although damaging earthquakes occur infrequently in the United States, they are no notice events that strike without warning, with potentially catastrophic consequences. As such, earthquakes require a higher level of preparedness on the part of everyone; from individuals to businesses to governments. Correspondingly, mitigation of the risk becomes that much more important. The 2006 NRC report observed that for the 1994 Northridge, California earthquake, direct losses were estimated at between $45 billion to $55 billion. Had this event occurred during working hours instead of the early morning hours of a Federal holiday, casualties would have been far greater. Exactly one year later, a similar earthquake struck Kobe, Japan. With a built environment somewhat similar to that of southern California, this event caused more than 6,300 deaths, with estimated direct losses exceeding $120 billion. Both earthquakes were under magnitude 7 (M7).

While it has been 20 years since the Northridge earthquake, according to the U.S. Geological Survey (USGS), there are several faults, including the Hayward Fault in East Bay of San Francisco and the southern San Andreas Fault east of Los Angeles, that are past due for experiencing a significant event. In fact, recent findings from the USGS show a significantly increased potential for damaging earthquakes in hazard-prone areas. According to the new forecast recently prepared by the USGS, there is a 99.7 percent chance that the State of California will experience a M6.7 or larger earthquake during the next 30 years.

[1] National Research Council, *Improved Seismic Monitoring, Improved Decision Making – Assessing the Value of Reduced Uncertainty, 2006.*

In the history of the United States, earthquakes M6.5 or greater have occurred in Alaska, California, South Carolina, and Utah as well as the Central and New England Regions. Geological evidence, confirmed by Japanese historical records, indicates that earthquakes as large as M9 have occurred in the Pacific Northwest. Because few large magnitude earthquakes have struck the United States since it became urbanized, American society tends to underestimate the true risk from earthquakes.

Given the urbanization of the past century, the NRC concludes that a major earthquake located under one of several key urban regions in the United States could potentially cause thousands of casualties and losses approaching $200 billion. Accordingly, reducing earthquake losses is a matter of significant national concern. Even a localized earthquake could have national economic consequences; for example, several economic and engineering analyses have indicated that an event in the central United States on the New Madrid fault could significantly affect our economy by shutting down oil and gas distribution lines to the Northeast as well as shutting down commercial traffic that crosses the Mississippi River.

Recent findings from the USGS show a significantly increased potential for damaging earthquakes in hazard-prone areas. Many citizens in these areas have not acknowledged the threat. Our goal is to provide information, education, and tools that will result in reduced potential losses if damaging earthquakes occur. The earthquake risk that our nation faces is serious, but it can be reduced, and this responsibility is shared by Federal, state, local, and tribal governments, along with the private sector.

The National Earthquake Hazards Reduction Program

The NEHRP is the federal government's coordinated approach to addressing earthquake risks. The Program involves the coordinated efforts of four federal agencies - FEMA, USGS, the National Science Foundation (NSF), and the National Institute of Standards and Technology (NIST). Congress first authorized the National Earthquake Hazards Reduction Program (NEHRP) in 1977 (Public Law 95-124) to "reduce the risks of life and property from future earthquakes in the United States." The most recent reauthorization, Public Law 108-360, authorized NEHRP funding through Fiscal Year (FY) 2009.

The premise of the program is that while earthquakes may be inevitable, earthquake disasters are not. NEHRP activities reach beyond basic and applied research to technology development and transfer, training, education and advocacy for seismic risk reduction measures. The program is a collaborative one, with NEHRP agencies working together with other federal and state agencies, universities, and private, regional, voluntary and professional organizations.

Since NEHRP was first authorized in 1977, the population of the United States has increased from 200 million to more than 315 million, with much of this increase in high seismic areas. Many elements of our aging national infrastructure are reaching the end of their service life without replacement, and have never been tested by strong earthquake shaking. Ensuring this nation's resiliency and maintaining global competitiveness requires that practices to mitigate earthquake impacts in the United States, both in new construction and in its existing structures, be cost-effective for all levels of government and private interests.

FEMA and our NEHRP partners have made significant progress in earthquake safety since the NEHRP was established 36 years ago. Although changing demographics and economic conditions present challenges, the program is committed to building on that progress to develop practical solutions to reduce the earthquake risk and ensure our nation's continued resiliency.

The NEHRP Vision and Mission are the basis for program direction and planning, and provide the structure and focus for all NEHRP activities.

> The NEHRP Vision is: *A nation that is earthquake-resilient in public safety, economic strength, and national security*.
>
> The NEHRP Mission is: *To develop, disseminate, and promote knowledge, tools, and practices for earthquake risk reduction—through coordinated, multidisciplinary, interagency partnerships among the NEHRP agencies and their stakeholders—that improve the Nation's earthquake resilience in public safety, economic strength, and national security.*

Three overarching, long-term goals, with 14 associated objectives, support the NEHRP mission:

- Goal A: Improve understanding of earthquake processes and impacts.
- Goal B: Develop cost-effective measures to reduce earthquake impacts on individuals, the built environment, and society-at-large.
- Goal C: Improve the earthquake resilience of communities nationwide.

The activities of the four NEHRP agencies are part of a process referred to as the "research-to-practice pipeline." NSF and the USGS support the basic research that produces scientific advances. NIST and FEMA incorporate these advances into applied research that contributes to the development of mitigation tools and information. FEMA and NIST then promote and facilitate use of these tools and information by those involved in implementing earthquake mitigation measures. FEMA leads related program implementation efforts including training, dissemination and outreach.

FEMA's Role in the NEHRP

Other than agency-specific implementation work (such as USGS earth science implementation activities), FEMA is responsible for the majority of the program's general implementation activities. In this role, we work to translate the results of research and technology development from NEHRP partners and other sources into effective earthquake loss reduction measures for Federal, state, local, territorial and tribal governments, as well as industry and individuals.

Historically, we have provided technical and financial assistance to states and multi-state consortia to increase awareness of the earthquake hazard risk and to foster plans to reduce seismic vulnerability. FEMA also develops and supports public education and awareness programs on earthquake loss reduction. Further, we support the development and dissemination of improved seismic design and construction criteria for new buildings and retrofit guidance for

existing buildings. All of this material is made available to building design professionals, and all government entities for voluntary use through model building codes and standards and through educational materials and courses for the public.

FEMA prides itself on maintaining strong partnerships with the other NEHRP agencies, state governments, academia, the research community, code enforcement officials, building design professionals and the private sector. These partnerships have been vital to the success of NEHRP during the past 30 years, and they will be pivotal to our continued success in what lies ahead to reduce the exposure of our people, our economy, and our overall security as a nation to the threats of earthquakes and other related hazards.

Under the current NEHRP reauthorization, FEMA has nine specific responsibilities:

1. Work with the developers of national codes and standards to promote implementation of research results;
2. Promote better building practices within the building design and construction industry;
3. Operate a grant program to assist states in developing mitigation, preparedness, and response plans; prepare inventories and conduct seismic safety inspections of critical structures and lifelines; update building and zoning codes and ordinances to enhance seismic safety; increase earthquake risk awareness and education; and encourage development of multi-State groups;
4. Support implementation of a comprehensive earthquake education and public awareness program, including development and dissemination of materials to all appropriate audiences;
5. Prepare, maintain, and disseminate seismic resistant design guidance and related information on building codes, standards, and practices for new and existing buildings, structures, and lifelines, and inform the development of performance-based design guidelines and methodologies supporting model codes for buildings, structures, and lifelines;
6. Execute the National Response Framework when required after an earthquake and support state planning;
7. Combine earthquake hazards risk reduction with other natural and technological hazards;
8. Provide preparedness, response, and mitigation recommendations to communities after an earthquake prediction has been made by the USGS; and
9. Establish demonstration projects on earthquake hazard mitigation.

FEMA Earthquake Program Successes

Under the NEHRP, FEMA has had many successes since we last appeared before this committee. I would like to take the opportunity to tell you about some of them.

Translating Research Results into Design Guidance

FEMA has a long history of working with our partners to develop and put into place earthquake resistant provisions in the nation's model building codes and consensus standards. Since 1985,

FEMA has periodically updated and published the *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures*. The current 2009 edition (FEMA P-750) continues to serve as the basis for the seismic provisions of the consensus building design standards published by the American Society of Civil Engineers and the nation's model building code promulgated by the International Code Council (ICC).

In addition to the primary resource document, FEMA has also published the *2009 NEHRP Recommended Seismic Provisions: Design Examples* (FEMA P-751CD) and the *2009 NEHRP Recommended Seismic Provisions: Training and Instructional Materials* (FEMA P-752CD). These products present a series of design examples and related instructional materials and programs for training purposes.

Working with National Model Codes and Standards

FEMA was instrumental in helping the ICC develop the seismic provisions of the International Building Code. When it was published in 2000, this code became the first single nationally applicable U.S. building code. The International Codes now serve as the basis for state and/or local building codes in all 50 States and six territories. FEMA's involvement with the code change process dates back more than 30 years, and our work is well respected within the code community. FEMA's ongoing work with the International Building Code has kept it substantially equivalent to the *NEHRP Recommended Seismic Provisions* for more than 15 years, thereby satisfying the requirements of Executive Order 12699.

For the 2015 edition of the International Codes, FEMA developed and submitted several changes. Among the most significant: changes to the International Residential Code (IRC) to improve seismic wall-bracing requirements. FEMA and other organizations also successfully testified against several changes that would have weakened the IRC.

FEMA also had a significant role in the update of ASCE 41-13, Seismic Evaluation and Retrofit of Existing Buildings. With our support, this update was able to combine two different standards, ASCE 31 for Seismic Evaluation and ASCE 41 for Seismic Rehabilitation, and eliminate numerous conflicts between the two previous standards.

State and Local Adoption of Building Codes

FEMA promotes and monitors the adoption of building codes to help ensure that communities are adopting disaster-resistant provisions of the building codes, resulting in improved resilience and better building construction practices in areas prone to natural hazards. FEMA uses the Building Code Effectiveness Grading Schedule, a tool owned by the Insurance Services Organization that evaluates and scores local building code departments for code adoption and enforcement for insurance credit every five years. FEMA has purchased the use of the data to track the rate of code adoption. In 2012, 55 percent of the jurisdictions in hazard-prone regions (earthquake, wind, and flood) adopted disaster-resistant building codes equivalent to the International Codes. By 2013, that percentage had increased to 57 percent.

Promoting better building practices within the design and construction industry

FEMA has developed and published more than 100 earthquake-related publications under NEHRP funding to promote better building practices. They are all available free of charge

through FEMA. These publications address everything from non-linear seismic analysis procedures to homeowner safety tips. Some of these publications, like the *Rapid Visual Screening of Buildings for Potential Seismic Hazards* (FEMA 154) and *Homebuilders Guide to Earthquake-Resistant Design and Construction* (FEMA 232), have distribution numbers of more than a thousand per year.

Developing Performance-Based Seismic Design Guidelines

The previous NEHRP reauthorization required FEMA to fund the development of Performance Based Seismic Design (PBSD) Guidelines. This is also an area identified as a NEHRP Strategic Priority. The FEMA PBSD project is a multi-year effort to develop a next generation Performance Assessment Methodology and Guidelines for new and existing buildings, and builds on research funded by NSF, particularly the Pacific Earthquake Engineering Research Center (PEER), and conducted by NIST.

Ultimately, PBSD will allow a building owner to go beyond the current life safety code level performance and actually evaluate how their building is likely to perform in a given earthquake, considering uncertainties inherent in both the potential hazard and the actual building response. This would permit the design of new buildings or the upgrade of existing buildings with a realistic understanding of the risk of casualties, occupancy interruption and economic loss that may occur as a result of future earthquakes.

FEMA, through a contract with the Applied Technology Council (ATC), has completed a multi-year project to develop a methodology for assessing how a building is likely to perform in an earthquake, given the uncertainties inherent in the potential hazard and the actual building response, and to communicate performance in ways that better relate to the decision-making needs of stakeholders. This project will permit the design of new buildings or the upgrade of existing buildings with a realistic understanding of the risk of casualties, occupancy interruption, and the economic loss that may occur as a result of future earthquakes.

The three FEMA P-58 volumes are the first phase in the development of Performance-Based Seismic Design Guidelines. To allow for practical implementation of the methodology, project work included the collection of fragility and consequence data for the most common structural systems and building occupancies, and the development of an electronic Performance Assessment Calculation Tool (PACT) for performing the probabilistic computations and accumulation of losses. The three volumes are FEMA P-58-1, *Seismic Performance Assessment of Buildings, Volume 1 -Methodology;* FEMA P-58-2, *Seismic Performance Assessment of Buildings, Volume 2 – Implementation Guide;* and FEMA P-58 CD, *Seismic Performance Assessment of Buildings, Supporting Electronic Materials and Background Documentation.*

FEMA is now in the second year of the Phase 2 contract with ATC, which will use the Performance Assessment Methodology to develop a series of PBSD Design Guidelines for use with different structural systems and building occupancies. It will also develop a series of non-technical Stakeholder Guides to show building owners and regulators how to best utilize PBSD for their building.

Weak Story Buildings
At the request of the City of San Francisco, FEMA contracted with the ATC to examine whether it was possible to seismic retrofit just the first story of a weak story building to achieve seismic safety. A weak story building is a multi-story, wood frame residential building where the first floor is much weaker than the upper stories due to extensive garage or store front openings. The Marina District apartment buildings that collapsed in the 1989 Loma Prieta earthquake and the garden style apartment buildings with first floor "tuck under" parking that collapsed in the 1994 Northridge earthquake are both examples of weak story buildings.

As a result of that study, FEMA published *Seismic Evaluation and Retrofit of Multi-Unit Wood Frame Buildings with Weak First Stories* (FEMA P-807) last year. This document and its electronic Weak Story Tool have served as the basis for a recently passed City of San Francisco ordinance requiring the seismic retrofit of the first story of these hazardous buildings.

Software for Seismic Evaluation of Buildings
Rapid Observation of Vulnerability and Estimation of Risk (ROVER) is a free mobile software for pre- and post-earthquake building safety screening. ROVER automates two paper-based seismic safety screening procedures: FEMA P-154, *Rapid Visual Screening (RVS) of Buildings for Potential Seismic Hazards,* and ATC-20, *Post-earthquake Safety Evaluation of Buildings*.

ROVER's pre-earthquake module can be used by field inspectors to quickly compile an electronic inventory of buildings, record important seismic features of a building, and generate an automatic estimate of the need for detailed seismic evaluation. ROVER's post-earthquake module can be used to quickly perform and manage the safety tagging (red, yellow, and green tags) almost universally applied to buildings after earthquakes. ROVER has been successfully pilot tested in Salt Lake City by the Utah Seismic Safety Commission and the Structural Engineers Association of Utah and by the Los Angeles Unified School District.

The ROVER Server is capable of operating as an online service for the smartphone client and as a website for direct access by any web browser. The website service is optimized for the small screens found on a smartphone or on any Internet-connected tablet. An updated edition of FEMA P-154 ROVER CD*, Rapid Observation of Vulnerability and Estimation of Risk*, will soon be available from the FEMA Publications Warehouse. The beta version of ROVER and an updated user manual are available from the user group ROVER Ready Alliance at http://www.roverready.org.

Non-Structural Mitigation Guidance
The nonstructural portions of a building can account for as much as 75 to 80 percent of a building's total cost. Given the importance of nonstructural building components, FEMA has completed the fourth edition of FEMA E-74, *Reducing the Risks of Nonstructural Earthquake Damage*. This e-publication significantly updates and expands the content and, for the first time, provides this material in an internet web-based format. FEMA E-74 contains more than 70 examples of different nonstructural components, complete with photos of actual damage and details illustrating correct mitigation and installation measures. The new web format makes it simple to browse and print out the relevant details.

Recent earthquakes in Chile, New Zealand and Japan provided many examples of buildings that performed well structurally but still suffered significant nonstructural damage and were rendered unusable for significant amounts of time. Some of the lessons learned from these earthquakes, such as the collapse of 70 percent of the elevators impacted by the earthquake in Chile, the collapse of emergency exit stairways in Christchurch, and the collapse of suspended ceilings in Japan, have been incorporated into FEMA's most recent update of this publication.

Multi-hazard Mitigation Guidance

In 2008, FEMA completed the *Guidelines for Design of Structures for Vertical Evacuation from Tsunamis* (FEMA P-646), a document jointly funded by FEMA under NEHRP and the National Oceanic and Atmospheric Administration under the National Tsunami Hazard Mitigation Program. Vertical evacuation from tsunamis is a critical issue for several coastal communities along the West Coast of the United States that are vulnerable to tsunami, and would not be able to evacuate to high ground for a near source tsunami such as from the Cascadia Subduction Zone. A large tsunami could result in a significant loss of life, and communities are looking for alternatives such as vertical evacuation structures. The first of these Vertical Evacuation Structures is now under construction: a gymnasium addition to an elementary school located on the coast in Grays Harbor, Washington.

Training Programs

Under the NEHRP, FEMA funds the National Earthquake Technical Assistance Program (NETAP) to support and make available earthquake mitigation training for state, local, and tribal and territorial officials, businesses and others throughout the United States. The NETAP training courses include: Procedures for Post-Earthquake Safety Evaluation of Buildings (ATC-20); Rapid Visual Screening of Buildings for Potential Seismic Hazards (FEMA 154); Earthquake Hazard Mitigation for Nonstructural Elements (FEMA E-74); and Seismic Evaluation and Retrofit of Multi-Unit Wood Frame Buildings with Weak First Stories (FEMA P-807). In FY 2013, in-person training was provided through NETAP to about 4,500 people via 93 courses in 14 States and U.S. Territories.

Another FEMA training product, *Seismic Rehabilitation Training for One and Two Family Dwellings* (FEMA P-593) was recently adopted by the California Earthquake Authority (CEA), which is California's residential earthquake insurance carrier, as the basis for their mitigation contractor training program.

Assisting States in Developing Mitigation, Preparedness and Response plans

FEMA administers the all-hazards Pre-Disaster Mitigation (PDM) Grant Program for States and communities; the Hazard Mitigation Grant Program (HMGP), an all-hazards post-disaster grant program; and the Emergency Management Performance Grants (EMPG) Program, which is administered by FEMA's Preparedness Directorate and provides grants to states to improve emergency management performance. With these grants, state agencies can fund planning activities and projects to protect their citizens from earthquake hazards.

Both of these programs have been used to fund more than 170 seismic retrofitting projects since 2000, including:

- Structural retrofit of Southern Illinois Hospital's three campuses;
- Ten different school seismic retrofit projects across California;
- Ten different hospital seismic retrofit projects across California; and
- More than 30 seismic retrofitting projects of local government buildings and facilities across California.

Multi-State Consortia

Under the NEHRP, FEMA continues to work closely with its partner organizations and multi-state consortia and organizations to support earthquake-related outreach and educational activities to promote earthquake mitigation and awareness. These partners include:

- Earthquake Engineering Research Institute (EERI), the largest earthquake membership organization;
- Federal Alliance for Safe Housing (FLASH);
- Southern California Earthquake Center (SCEC), which operates the ShakeOut training;
- Cascadia Regional Earthquake Working Group (CREW), which serves states in the Pacific Northwest in the Cascadia subduction zone;
- Central United States Earthquake Consortium (CUSEC), which serves the states in the New Madrid seismic zone;
- Northeast States Emergency Consortium (NESEC), which serves northeastern states on a multi-hazard basis; and
- Western States Seismic Policy Council (WSSPC), which serves states with a seismic hazard.

These long-time partners of FEMA play an invaluable role in coordinating multi-state response and recovery planning and in public awareness, education, and outreach. They are also active partners in the ShakeOut earthquake drills that take place in schools, businesses and homes across the United States.

In FY 2013, these cooperative agreements were focused on providing support to states. FEMA is collaborating and coordinating with these grantees to ensure substantial involvement and mutual partnership in executing local and regional risk reduction outreach and implementation activities for earthquakes and other hazards. This includes earthquake mitigation planning, property inventory and seismic inspection of critical facilities, updating building codes and zoning ordinances, earthquake outreach and education, and the development of multi-state groups in support of local earthquake and other multi-hazard initiatives.

Outreach and Awareness

Under the NEHRP, FEMA produces several earthquake outreach products that have been very successful. For example, FEMA distributes nearly 8,000 copies of its Home Hazard Hunt poster every year.

ShakeOut, which started in Southern California in 2008, is now serving as a framework for related outreach activities. It has grown exponentially and in 2013, almost 19 million people

participated in ShakeOut activities worldwide, including participants from 42 States and U.S. Territories.

ShakeOut aligns well with NEHRP goals to improve understanding of earthquake processes and impacts, develop cost-effective measures to reduce these impacts and improve the earthquake resilience of communities nationwide. In particular, ShakeOut has become a vehicle for providing earthquake information to the public and involving them in improving community resiliency. While assessing participation via registration and showcasing ShakeOut activities have been essential from the start, evaluation results to be published in 2014 will document what participants have been learning and improving with respect to preparedness and mitigation.

The success of ShakeOut is due in part to the direct financial support from FEMA under NEHRP, which provides funds to the states and U.S. Territories for activities such as the development of ShakeOut websites, templates, drill guides, registration support, and for technical planning assistance. The success of ShakeOut also is a tribute to the very active involvement and support from FEMA Preparedness, Regional Staff, the Earthquake Country Alliance (ECA), SCEC, the four regional earthquake consortia, State Earthquake Program Managers, the private sector, and many others.

Lifelines

Lifelines are systems that are necessary to provide electric power, oil and natural gas, water and wastewater, communications and transportation facilities and services that are essential to the well-being of communities. Although lifelines are unique in that they are distributive systems that must be considered as an entire system rather than a series of individual isolated components, they are also interdependent in many ways. Put simply, the failure of one system can cause failures in others. Lifeline systems often serve multiple communities crossing jurisdictional boundaries.

In the early 1990's, FEMA researched and developed several publications that addressed the issue of seismic safety of different lifeline systems. This culminated in the development of *A Plan for Developing and Adopting Seismic Design Guidelines and Standards for Lifelines* (FEMA 271). Based on that plan, FEMA funded the American Lifelines Alliance (ALA) to begin developing these proposed standards. However, with staffing and funding cuts in the late 1990s, FEMA halted all lifelines-related work to focus its limited resources on buildings.

The most recent lifelines work is a new Lifelines Action Plan currently being completed by ATC for NIST. FEMA staff did participate in this project and helped author portions of the plan. One key element to come out of that plan is the need to improve the resiliency of lifelines, including power, water, and communications, as lifelines are a critical component for ensuring a community's resiliency.

Earthquake State Assistance

Several years ago, FEMA requested and received additional resources to provide Earthquake State Assistance funding directly to participating states through a series of cooperative

agreements. These cooperative agreements were used to support state activities to reduce future earthquake losses. Section IV of the NEHRP Annual Report of the National Earthquake Hazards Reduction Program for 2012, published in February 2014, provides a thorough listing of these state accomplishments.

Some examples include:

- Using FEMA's ROVER to assess the safety of schools in Utah along the Wasatch Fault. A similar program of assessing the seismic safety of public schools has been undertaken in Oregon.
- Using FEMA funds, the California Critical Infrastructure Review for Seismic Vulnerabilities (Cal VIVA) project identified, evaluated and developed basic retrofit actions for seismically vulnerable state buildings that are essential to post-earthquake response and recovery effort.
- The State of Illinois held four post-earthquake inspection training classes using FEMA funds, resulting in 189 additional trained inspectors. At present, Illinois has 466 trained inspectors in their database.

A subsequent legal interpretation in FY 2012 linked this program to the original NEHRP state grant program and required that the state cooperative agreements include a 50 percent cash match. Nearly half of the 33 participating states were unable to meet that requirement. This led FEMA to decide to prioritize funding toward the earthquake consortia and other partners to more effectively reduce earthquake risk.

This year, FEMA will prioritize funding through its earthquake consortia and other partners as a means to more effectively focus earthquake hazard preparedness and education efforts nationally, regionally and across states and territories most vulnerable to earthquakes.

FEMA will continue to work with our partners and emergency management colleagues to further support the NEHRP mission and to identify ways to leverage resources to further reduce earthquake risk.

FEMA's Vision for the Future of the NEHRP

We believe that for the NEHRP to remain relevant in the 21st century, it is not enough to just study the earthquake problem; we must also develop and implement effective mitigation solutions. To do this, we must continue to evaluate our program priorities and focus our activities to emphasize implementation. We must be able to provide not only the tools needed to reduce future losses, but also the tools, education and incentives to encourage their use.

The NEHRP has been extremely successful in developing an impressive array of products that have been used effectively by engineers, architects and building regulators when they have been given the resources to address the hazard. There needs to be additional efforts applied to creating incentives and public demand, and securing the time and resources necessary to reduce the risk from earthquakes.

Part of the challenge is a lack of understanding or knowledge of the actual seismic threat that exists in a given area. There has traditionally been public perception that building to the code will result in a structure that will not be damaged and, even if it is, the federal government will make it "whole" again through disaster assistance. Both assumptions are false. Building codes only provide the minimum level necessary to protect lives, and do little to prevent damage, and federal disaster assistance was never meant to be a substitute for insurance.

Changing perceptions is key to serving the basic mission of NEHRP. Just as the American consumer has come to consider the safety of a vehicle to be a significant factor when buying a car, we envision a future where one of the key criteria in buying a house or building will be its safety from all hazards – how well was the building designed and constructed and whether it is certified to meet or even exceed a certain level of code performance and an associated level of safety.

Unfortunately, one of the major weaknesses of the NEHRP is our lack of leverage for local and state levels of government to implement earthquake risk-reduction measures. So we must look for and find ways to provide this leverage with incentives and rewards for communities at risk that adopt and enforce adequate mitigation standards.

That is not to say we have not had any success working at the local level. An excellent example of what can be done is currently taking place in Los Angeles, where a senior USGS official is on loan to the Mayor of Los Angeles's office to develop a city seismic safety program. Several aspects of this plan, which are currently being developed, are based on FEMA building design guidance publications. This effort is being supported by FEMA-funded subject matter experts. For example, concrete buildings constructed prior to the mid-1970s may not have sufficient reinforcing steel to confine the concrete during earthquake ground shaking. Some of these buildings are a collapse hazard, but not all of them, and determining which ones need to be retrofitted has been a significant problem. FEMA is currently working on a guidance document that would allow an engineer to evaluate a building to make this distinction. Although it will likely be completed in two years, the City of Los Angeles is eager to receive the guidance and is planning to reference the report in a proposed ordinance to address these buildings.

The current public policy emphasis on improving the resiliency of our nation's built environment through pre-disaster mitigation offers new avenues that we need to pursue in order to get our earthquake disaster-resistance message into the hands of those who can best use this information. Our hope is that the current emphasis on improving our resiliency will serve both as the catalyst and the foundation for future risk-reduction activities by public and private sector interests.

Ultimately, the program will need to explore possible incentives that will encourage the use of our technology by the American public. Several years ago a study done by the Earthquake Engineering Research Institute, with NEHRP funding from FEMA and the State of California, provided some possible incentives. The findings of that study need to be pursued.

It is important to note, however, that all of this is taking place in the context of diminishing federal budgets. This requires a careful review to ensure the best use of the resources of all of the parties, both public and private. This means that we need to emphasize those aspects of our

program that offer the greatest promise of helping communities and individuals acknowledge their risk, accept responsibility for reducing that risk and take appropriate actions to become more disaster-resistant.

One issue that remains challenging is that under NEHRP, the breakout between research and implementation continues to be roughly three to one. We continue to leverage the resources we have, not just within our agency, but at all levels, including private industry, by coordinating with our partners to put our collective resources to their best use. One of the best examples we can use to illustrate how we leverage our resources is in updating the *NEHRP Recommended Provisions for New Buildings*. This document serves as the basis for the nation's seismic code provisions and is updated for us periodically to maintain its consensus backing. To achieve this, we rely heavily on the efforts of volunteers, and it has been estimated that we in fact get eight dollars of work for every dollar we spend on this initiative.

Another challenge is communicating risk to different audiences in different parts of the country. Competing for the attention of the public to promote earthquake preparedness and mitigation is difficult in an environment where other hazards occur with greater frequency, even with less consequence. This is especially true in areas where earthquakes occur infrequently, even though they may be a very high hazard, such as the New Madrid Fault Zone, and in Charleston, South Carolina. The perception of the earthquake threat in California, where earthquake loss reduction is viable and risk perceived as probable, is far different than in other areas of the country, such as the New Madrid region with its high potential of loss but with a lower probability of occurrence, where the perception of risk is minimal. The general population of New England and other areas on the East Coast represent an even greater contrast in that there is still a significant hazard but little perception of earthquake risk. A risk communications strategy will need to acknowledge these differences. The NEHRP will need to shift its focus to put a greater emphasis on behavior to understand how to influence perceptions, how to effectively communicate information in a way that helps those affected to not only understand their risk but begin to manage it as well.

Conclusion

In conclusion, NEHRP has been a very successful program and has done much to improve this nation's ability to prepare for, respond to, recover from, and mitigate against future earthquakes.

It is beneficial to look back and celebrate our successes over the program's history, and we have many of which we are proud. But it is also healthy, if not necessary, to look forward and plan where we are going in the future. We at FEMA can assure you that we will continue to play a key role in the NEHRP to help prepare and protect the American people from the earthquake hazard.

I want to express my appreciation for the consistent support and counsel of this Subcommittee and look forward to our continuing association in addressing the challenges before us.

Thank you, and I will be happy to answer any questions that the Subcommittee may pose.