

**National Earthquake Hazards Reduction Program
Advisory Committee on Earthquake Hazards Reduction
National Science Foundation
Arlington, Virginia
November 23–24, 2009**

Meeting Summary

Advisory Committee Members:

Chris Poland, Chair	Degenkolb Engineers
Walter Arabasz	University of Utah
James Beavers	University of Tennessee
Jonathan Bray	University of California, Berkeley
Richard Eisner	Fritz Institute
James Harris	J. R. Harris and Company
John Hooper	Magnusson Klemencic Associates
Michael Lindell	Texas A&M University
Thomas O'Rourke*	Cornell University
Paul Somerville**	URS Corporation
Susan Tubbesing	Earthquake Engineering Research Institute
Anne vonWeller	Chief Building Official, Murray City, Utah
Yumei Wang	Oregon Department of Geology and Mineral Industries
Sharon Wood*	University of Texas at Austin
Brent Woodworth	Global Crisis Services, Inc.
Mark Zoback	Stanford University (SESAC ex-officio liaison)

**participated via conference call **not in attendance*

NEHRP ICC Member-Agency Representatives and NIST Support:

Patrick Gallagher	NIST Director
Shyam Sunder	NIST BFRL Director <i>Designated Federal Official</i>
Jack Hayes	NIST, NEHRP Director
Edward Laatsch	FEMA
Dennis Wenger	NSF
Tom Monahan	NSF
David Applegate	USGS
Tina Faecke	NIST, NEHRP Secretariat
Michelle Harman	NIST, NEHRP Secretariat
Jeff Dragovich	NIST

Jay Harris	NIST
John Filson	USGS Emeritus, NEHRP Secretariat
Ugo Morelli	FEMA Emeritus, NEHRP Secretariat
Francoise Arsenault	BRI, NEHRP Secretariat

Guests:

Corina Cerovski-Darriau	AGI
Darrell Darnell	Director Critical Infrastructure Protection and Resilience Policy
Jeffrey Harrington	U.S. Department of Commerce Ethics Law and Programs Division
Mike Mahoney	FEMA
Michael Meirovitz	Lewis-Burke Associates
Daniel Pless	Sandia National Laboratory Daniel Pless Science Advisor to the Homeland Infrastructure Threat and Risk Analysis Center, DHS
Richard Reed	Special Assistant to the President for Homeland Security and Senior Director for Resilience Policy
Susan Smith	Deputy Chief Risk Development and Modeling Branch Homeland Infrastructure Threat and Risk Analysis Center, DHS
Jim Wilkinson	CUSEC

Summary of Discussions

I. Welcome New Members, Review Meeting Goals and Agenda

Mr. Poland, Chair of the Advisory Committee on Earthquake Hazards Reduction (ACEHR), welcomed everyone to the meeting and reviewed the charge for ACEHR and the primary goal of the meeting: to gather information for the 2010 ACEHR annual report. (The meeting agenda is attached to this summary.) After introductions from committee members and guests, the Chair introduced The Honorable Pat Gallagher, Director of NIST.

II. Welcome and Opening Remarks

Dr. Gallagher welcomed the members and thanked them for their time and contributions. He specifically acknowledged the efforts of Chris Poland. Dr. Gallagher stated that ACEHR advises him in his role as Chair of the NEHRP Interagency Coordinating Committee (ICC). Dr. Gallagher then reviewed the pending NEHRP reauthorization and funding status.

Dr. Gallagher commented that the Administration is looking for ways to broaden and integrate the impact of programs such as NEHRP. He emphasized that NIST takes NEHRP and the recommendations from ACEHR very seriously and thanked the members again for their service.

III. Administration Resilience Policies

Presentation

An invited guest, The Honorable Richard Reed, Special Assistant to the President and Senior Director for Resilience Policy, discussed the Administration's initiatives for a resilient society.

Mr. Reed stated that this Administration views resilience in terms of both policy and implementation dealing with a multitude of threats, from the H1N1 flu to terrorism. He indicated that the Administration's primary goal is to attain the ability to continue essential functions in the face of threats and disasters. The President, who attended a recent catastrophic earthquake exercise, has emphasized the importance of resilience to a secure Nation, and is an advocate of infusing this concept into the national conscience. Mr. Reed noted that the "green" industry has accomplished a great deal through energy efficiency certification and that similar concepts could be applied to resilience capability.

Mr. Reed discussed cost sharing under the Stafford Act and other programs as an avenue for advancing resilience. Mr. Reed noted the importance of bottom to top resilience initiatives, starting with engaging stakeholders and communities at the local level.

Mr. Reed noted that the "supply on demand" aspect of our industrial and utilities sectors had driven out excess capacity needed for adequate resilience in the face of disasters. He also advocated the application of engineering principles to all national sectors for both safety and security.

Finally, he recognized the work and experience of the ACEHR and the NEHRP agencies and welcomed input from ACEHR on how its experience and insights could benefit his efforts on the broad issues of national resilience in general and NEHRP in particular. .

Discussion

The members had a number of questions and comments for Mr. Reed and Mr. Darnell, the Director of Critical Infrastructure Protection and Resilience Policy, on national resilience. These comments and questions covered a wide range of subjects and issues including:

Incorporation of contingencies into exercise planning, i.e., what will happen 30 years from now if building codes are not adopted? Mr. Reed stated that the President and his Cabinet recognize the need for parallel systems to avoid cascading effects, and the key concern is

ensuring the “lights stay on” so that other response and recovery systems can function.

The need to identify and engage people with problem-solving skills in the resilience building efforts. Mr. Darnell responded that the President has made this a priority with the National Professional Development Program, meant to develop professionals at the federal, state, and local levels who can understand roles, responsibilities, and requirements in mitigation, response, and recovery.

The Administration plans to address the complexity of who does what in a catastrophe. Mr. Reed stated this issue is at the forefront of those being addressed. He cited the H1N1 flu as a good example of looking back in history to learn what should occur moving forward. When the H1N1 outbreak began to occur, the Administration brought in about eight or nine former heads of agencies from the first swine flu outbreak in the 1970s to discuss lessons learned.

The need to break down the reluctance among agencies to cooperate in order to better understand various threats to homeland security. Mr. Reed responded that agency programs chase funding, and that resistance is a leadership and management problem rather than a policy problem. It is up to ACEHR and others in the earthquake community to create an understanding of the vulnerabilities that can be exposed by an earthquake. It may take a generation to bring about this understanding. He noted that a recent presentation given by Dr. Applegate to cabinet-level officials on earthquake probability was very helpful to fostering this understanding.

What can ACEHR do to help advance resilience? Mr. Reed stated that the annual report from ACEHR and other documents are helpful. A challenge is in developing a common understanding of the term “resilience”. Structural engineers have understood resilience for some time, and making it understood across disciplines is very important.

Mr. Poland commented that the structural engineering community has been focused on *life safety* rather than *resilience*. Current building code requirements generally protect people and do not assure that the buildings will be repairable or available to support immediate recovery. Resilience will be achieved once built environment performance expectations are identified and communicated. He also remarked on the limited amount of seismic monitoring in the United States. A major earthquake will occur in the future but, without proper instrumentation, there will be little data on ground motion and structural response. The cost for installing additional instruments would not be prohibitive. Mr. Reed agreed that this is a major challenge. He stated that these policy issues are being considered by the Department of Homeland Security (DHS) Science & Technology (S&T) Directorate and others. He offered to share these concerns with the DHS S&T.

ACEHR members and the Administration guests engaged in a discussion on federal guidance for spending homeland security funding at the state and local levels. It was noted that earthquakes,

because of their similarities to a terrorist attack, pose a severe challenge for emergency managers. Mr. Darnell stated that it is a priority of the President and his Administration to broaden the definition of homeland security to encompass an all hazards approach. Dr. Gallagher remarked that ACEHR can help to broaden the definition of national security. He observed that ACEHR has a unique voice and can help to articulate goals for designing resilience into structures, and ACEHR perspective and recommendations can help to challenge and guide non-NEHRP federal agencies.

Dr. Sunder added that the NEHRP Strategic Plan provides the framework for resilience. NIST will provide Mr. Darnell and Mr. Reed with copies of the NEHRP Strategic Plan.

IV. Program Update

NEHRP Reauthorization

Dr. Sunder updated ACEHR on the NEHRP reauthorization process. The House Science and Technology Committee completed draft legislation (H.R. 3820, cited as the *Natural Hazards Risk Reduction Act of 2009*) and the Senate has begun work on a separate version of the reauthorization. H.R. 3820, yet to be put to a vote in the full House, includes significant changes. Most notably its multi-hazard scope includes wind (Title II) and fire research (Title V). H.R. 3820 also would reduce agency authorization levels by varying percentages to reflect appropriation levels for the NEHRP agencies. Other changes include revised agency responsibilities and NEHRP committee structures. For example, the Interagency Coordinating Committee (ICC) would be expanded to include the National Oceanic and Atmospheric Administration (NOAA) and would address the wind hazard issues. ICC meetings would be held twice a year rather than three times a year. A committee parallel to ACEHR would be established to address wind hazards and the NIST Director could establish additional committees to address other issues. A full annual report on agency activities would be due within one year of passage of the legislation and every two years thereafter. A report focused on agency budgets only would be due in alternate-years. A new NEHRP Strategic Plan would be required, combining previous requirements for the Strategic Plan and Management Plan. Finally, the Subcommittee on Disaster Reduction (SDR) of the National Science and Technology Council (NSTC) is directed to study and report on multi-hazard issues and opportunities to create synergies in relevant public and private sectors. The report from SDR would be required two years following enactment of the legislation.

The PowerPoint slides used by Dr. Sunder and Dr. Hayes (see *Program Update: Continued* below) for the NEHRP update were included in the meeting notebooks and were posted on the NEHRP website at http://www.nehrp.gov/pdf/ACEHRNov2009_NEHRP.pdf.

Discussion

The committee discussed the multi-hazard focus of the draft legislation and inquired if the legislation adequately addresses earthquake hazards. Dr. Sunder stated that earthquakes are dealt with separately in the draft legislation. The multi-hazard aspect is really focused on the SDR study and no multi-hazard program is being established by the legislation.

A member commented that NIST has been given some of the responsibilities requested by ACEHR, but without additional funds. Dr. Sunder responded that he was optimistic that NIST could meet its new responsibilities with existing and anticipated funding.

A member asked about the NIST NEHRP budget compared to funding for all of NIST. Dr. Sunder stated that the NEHRP funding is about one-eighth of his Laboratory budget of \$32 million.

A member asked about the NIST definition of a “resilient community.” Dr. Sunder responded that a resilient structure is different from a resilient community, the latter being of broader scope and embracing all aspects of society. This difference will be addressed over the next two years, including economic and social aspects of the issue.

A question was raised concerning challenges facing the ICC. Dr. Sunder responded that he saw no major challenges or problems. The ICC is very engaged, gives good advice, and has been good for NEHRP. The only challenge is that the support of the ICC takes significant time of the NIST/NEHRP staff that has been given new responsibilities in research development and management.

A member remarked that he is impressed with the seriousness with which NIST has taken on leadership of NEHRP. He added that it is discouraging that funds are not provided explicitly for this leadership role. Dr. Sunder stated that it is always difficult to fund management responsibilities. Institutional support functions are perceived as part of the agency mission.

Program Update: Continued

Dr. Hayes reviewed the budgets for the NEHRP agencies. He then reviewed highlights of the implementation of the NEHRP Strategic Plan, including the following:

- The October 2009 award by NSF to Purdue University for operation of the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES).
- Re-establishment of state assistance funds by FEMA.
- USGS upgrades to the Advanced National Seismic System (ANSS) with American Recovery and Reinvestment Act (ARRA) funding.

- Use of ARRA funds by NIST and NSF for research grants.
- FEMA completion of the 2009 *NEHRP Recommended Provisions*.
- Continued staff buildup at NIST and ongoing work in Performance-Based Seismic Design (PBSD).
- FEMA and NIST have initiated a formal interagency process to develop coordinated research and knowledge transfer activities.

Dr. Hayes thanked Dr. Harris for his presentation on New Madrid Seismic Zone (NMSZ) earthquake safety issues at the American Institute for Architects (AIA) meeting in Memphis, Tennessee this past August.

Dr. Hayes informed the members that the next full report on NEHRP activities and accomplishments will likely be the biennial report submitted in 2011.

Dr. Hayes reviewed the agency responses to the 2009 ACEHR letter report. He indicated that the House Science and Technology Committee agreed with the ACEHR recommendation to transfer the post-earthquake role from USGS to NIST.

He stated that efforts will be made to support the ACEHR recommendations on lifelines, as resources permit.

He reported that NIST conducted a meeting of the Interagency Committee on Seismic Safety in Construction (ICSSC) in August. As time and resources permit, NIST will continue to work with ICSSC agencies.

He reported that NIST briefed the SDR in November on NEHRP. At that briefing, interest in working with NEHRP was expressed by the Federal Highway Administration and the National Aeronautics and Space Administration.

Dr. Hayes discussed the status of the National Research Council (NRC) study on a 20-year road map for NEHRP. The study, which will serve as an update to a 2003 report by the Earthquake Engineering Research Institute (EERI) and the NEHRP Strategic Plan, should be released by late spring or early summer 2010. Dr. Sunder stated that NRC policy is to not divulge the contents of its studies before their release.

Dr. Hayes also reported that work on the NEHRP Management Plan has been deferred, pending passage of reauthorization legislation.

Discussion

A member asked about the frequency of past ICSSC meetings. Mr. Morelli responded that the frequency of meetings in the past varied; at times the ICSSC met several times a year.

Mr. Poland asked for further explanation on action to be taken in response to the ACEHR recommendation on lifelines. Dr. Hayes stated that the recent ACEHR report seemed to suggest regulatory oversight by NEHRP, which the NEHRP agencies are not authorized to fulfill. He reiterated that the agencies will support research and development of safety practices for lifelines, as resources permit.

There was a general discussion of the ICC role in promoting resilience. Dr. Hayes stated that it is more appropriate at this time for the ICC, rather than the ICSSC, to promote resilience. At the August ICSSC meeting, it was apparent that in-house technical expertise in Federal agencies in earthquake safety has declined over the years, as agencies have been forced to trim such staff positions. Mr. Applegate commented that it would be of benefit to reference this decline in a follow-up letter to Mr. Reed.

The members discussed ARRA funding. Dr. Sunder noted that NIST received about 1,200 proposals for \$35 million in stimulus funds. Mr. Poland commented that he hoped there is still some opportunity to provide direction on use of the funds to improve national resilience to natural disasters.

V. Committee Member Ethics

Mr. Harrington, Esq., an attorney with the U.S. Department of Commerce, Ethics Law and Programs Division, reviewed conflict of interest and ethics rules as they apply to the ACEHR members.

VI. USGS Update

Presentation

Dr. Applegate reviewed changes in the draft reauthorization legislation relevant to the USGS. The outdated wording in USGS responsibilities to “improve earthquake predictions” has been changed to “delivering real-time earthquake information”.

He noted that the FY2010 House bill would add \$1 million above the President’s budget request for Light Detection and Ranging (LiDAR) and seismological studies in areas with high earthquake risk. Some of those funds are being designated for multi-hazard activities.

Dr. Applegate informed the committee that USGS is using ARRA and multi-hazard funds for implementation of the ANSS and for the development of scenarios, two NEHRP strategic

priorities. He remarked that the ARRA has been a wonderful boost for ANSS. Meeting ARRA timelines and conditions required extraordinary efforts by the USGS and its regional partners. The funds will be used to modernize the networks but cannot be used to expand ANSS due to a requirement to keep out-year maintenance costs unchanged.

Dr. Arabasz commented that the modernization of ANSS stations, which can result in cost savings, helps in many ways, including improved communication capabilities, enhanced digital recording, and addition of strong motion sensors.

Dr. Applegate added that decisions on which stations to modernize are based on a combination of factors. Well over one-half of the stations identified as needing some improvement were upgraded. He also mentioned that an innovative, inexpensive approach to strong motion recording, the NetQuake project, is being pursued.

Dr. Applegate stated that the Global Seismographic Network (GSN) program received ARRA funding and is making upgrades to stations.

Dr. Applegate mentioned USGS products such as ShakeCast, Prompt Assessment of Global Earthquakes for Response (PAGER), the prototype LossPAGER, the new USGS hazard maps, (undergoing review), and the urban hazard maps developed for Seattle, Washington. The Seattle maps have been used extensively by the community; this is a very encouraging application of USGS products.

Dr. Applegate reported on highlights from the *Great California ShakeOut*. Building on the success of the November 2008 Great Southern California ShakeOut, this event has resulted in increased preparedness and mitigation activity. Nearly seven million people participated in this year's October 15 *ShakeOut* events.

Dr. Applegate stated that the USGS is continuing to work with FEMA on the New Madrid Seismic Zone (NMSZ) catastrophic planning and the National Level Exercise 2011. He discussed the importance of presenting a clear voice on the scientific evidence and uncertainties regarding earthquake hazards in the central United States. This voice is needed to counter a very active and vocal group publicly exploiting the uncertainties to claim a greatly reduced or negligible earthquake hazard in this area. The recent USGS Fact Sheet on the earthquake hazard in the NMSZ is an effort to clarify the situation. Dr. Zoback added that the campaign must continue to be waged in public because the public must know the facts - remaining silent is not an option. A member agreed, noting that this is a question not just of science but of public perception. The PowerPoint slides used by Dr. Applegate for his presentation were included in the meeting notebooks and posted on the NEHRP website at http://www.nehrp.gov/pdf/ACEHRNov2009_USGS.pdf.

Discussion

A member commented that NIST and USGS have done a remarkable job with limited funds over the past decade in redirecting their programs to practical applications. Dr. Applegate acknowledged the compliment, noting that there is a tremendous amount of dedication by USGS scientists and staff to their work. Mr. Poland noted that when Congress and the Administration have questions about earthquakes, they always ask USGS.

VII. NSF Update

Presentation

Dr. Wenger, filling in for Dr. Pauschke, provided an overview of NSF NEHRP activities. He stated that NSF used \$10 million of its ARRA funding to fund some worthy, NEHRP-related proposals for which there had previously been insufficient funds. This increased the proposal success rate from 8% to 13%.

Dr. Wenger reported a five-year grant for George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) operations had been awarded to Purdue University. In 2010 an award will be made for an assessment of NEES and its future. In 2012 NSF will make a decision regarding the future of NEES post-2014.

Dr. Wenger stated that the NEHRP Strategic Plan and the Grand Challenges both have a significant impact on earthquake engineering research at NSF. He discussed the NSF Rapid Response Research (RAPID) grants and the Early-Concept Grants for Exploratory Research (EAGER) program. RAPID is focused on collecting ephemeral data, such as in a post-earthquake situation. The focus of the EAGER grant program is to fund research that is truly innovative or exploratory with a low probability of success but very high impact if successful. NSF also has an Infrastructure Management and Extreme Events (IMEE) program. In IMEE, research is focused, at times, on social and economic implications of research across all hazards. Dr. Wenger discussed the very successful enabling Fellows Program that is now being conducted for the third time with 12 Fellows across the United States. Those who first served as Fellows are now serving as mentors. He observed that the project has changed the face of the engineering community. He also mentioned the Resilience and Vulnerability Observatory Network (RAVON) as another noteworthy project. The PowerPoint slides used by Dr. Wenger for his presentation were included in the meeting notebooks and posted on the NEHRP website at http://www.nehrp.gov/pdf/ACEHRNov2009_NSF.pdf.

Discussion

A member asked if the assessment to be conducted of NEES is typical policy. Wenger stated that the evaluation of NEES, which will assess NEES since its inception, is a standard part of the

NSF evaluation process. Another member asked if additional information could be provided on ARRA funding received by NSF. Dr. Wenger said he will pass the request along to Dr. Pauschke.

VIII. FEMA Update

Presentation

Mr. Laatsch provided members with an update on FEMA activities, new initiatives, funding, challenges, and opportunities related to NEHRP.

He reported on the State Earthquake Program Managers (SEPM) meeting in Cambridge, Massachusetts in early November. The meeting, attended by FEMA personnel and the Executive Directors and staff of the regional earthquake consortia, provided an opportunity to discuss both the re-established FEMA program of state earthquake grants and state plans for earthquake mitigation projects supported by the program. The state managers were very encouraged and energized to once again receive assistance funds for their work. State earthquake assistance in FY 2009 was \$2.3 million, a \$50,000 base amount to each of the 29 participating states and territories and the remainder based on a state's weighted exposure to risk. Mr. Laatsch added that he is positive that significant benefits will be realized as a result of the re-established program. FEMA will hire a new staff person to manage the state assistance program.

Mr. Laatsch also reviewed the FEMA Risk Management Series (RMS) of publications and the new Building Science publications. The latter includes the 2009 edition of the *NEHRP Recommended Provisions* that should be released by the end of the year as FEMA P-750 and will include new USGS seismic hazard maps. Supporting publications include FEMA P-751, Nontechnical Introduction; FEMA P-752, Design Examples, and FEMA P-753, Training Materials. Performance Based Seismic Design (PBSD) documents being developed include FEMA P-445, *Next-Generation Performance-Based Seismic Design Guidelines: Program Plan for New and Existing Buildings*, and the PBSD Performance Assessment Calculation Tool (PACT).

Mr. Laatsch provided an update on the FEMA QuakeSmart program, a community outreach program that has generated considerable interest and visibility for a relatively small amount of funding. Mr. Laatsch indicated that FEMA is trying to do a better job of community outreach and QuakeSmart has been successful in doing this.

Mr. Laatsch acknowledged the Earthquake Engineering Research Institute (EERI) and the Central United States Earthquake Consortium (CUSEC) for their ongoing cooperation and partnership with FEMA. The PowerPoint slides that Mr. Laatsch used to address these topics were included in the meeting notebooks and were posted on the NEHRP website at http://www.nehrp.gov/pdf/ACEHRNov2009_FEMA.pdf

Discussion

The committee discussed the need for an evaluation of the process and outcomes of QuakeSmart. Mr. Laatsch stated that an evaluation is planned; however, any evaluation now would be based on anecdotal data. He added that additional resources will be needed for a thorough evaluation. QuakeSmart has had limited funding and large expenditures; to evaluate it, may not be warranted. A suggestion was made to evaluate QuakeSmart through an NSF-funded university program, similar to the National Research Council evaluation of Project Impact. A member asked about the evaluation of other FEMA programs and products. Mr. Laatsch stated that FEMA does performance evaluation in a number of areas, including the adoption and enforcement of building codes by communities, implementation training, outreach, and information dissemination.

A member asked if FEMA is moving toward a multi-hazard approach to mitigation. Mr. Laatsch responded that FEMA was one of the first agencies to focus on multi-hazard mitigation; he cited Project Impact was an example.

IX. NIST Update

Presentation

Dr. Hayes reviewed how NIST is using the Applied Technology Council (ATC) “Roadmap” concept (outlined in report ATC-57), and its primary focus areas to help guide its NEHRP research program. NIST may support future work in two of the focus areas that are not currently supported: development of enhanced design productivity and interoperability and development of improved evaluation and strengthening of existing buildings. An added area of future potential focus is lifeline engineering. Dr. Hayes also discussed three recent NIST publications, the first of which was released about a year ago and received positive comment.

Dr. Hayes then introduced three new members of his staff. He mentioned new NIST projects, including the 2009 Assessment of ASCE-11 PBSD methods for new buildings in high seismic risk regions. He noted that FEMA has supported work through ATC on the Qualification of Building Science Performance and Response Parameters. NIST is trying to “benchmark” this work and is in Phase II of the study of ports and harbors.

Dr. Hayes emphasized that increased and effective collaboration with FEMA is helping to create synergies, bridge gaps, and foster a greater understanding of requirements. The PowerPoint slides that Dr. Hayes used to address these topics were included in the meeting notebooks and posted on the NEHRP website at http://www.nehrp.gov/pdf/ACEHRNov2009_NIST.pdf

Discussion

The committee discussed expanding NIST contacts with the Nuclear Regulatory Commission, so that the Commission could take advantage of some of the results of NIST research.

In response to a question about priority hiring areas, Dr. Hayes stated that NIST hopes to add two or three more staff, possibly including a person with geotechnical expertise. The short-term focus is to bring in younger staff to be mentored by senior staff members. Dr. Hayes indicated that a NIST goal is to return to experimental research, but that this will be expensive.

A member asked about the percent of research funded in-house versus that funded outside NIST. Dr. Hayes stated that the goal is roughly a 50/50 split. Extramural efforts will be achieved through a combination of task order contract efforts and a re-established earthquake research grants program. In response to a question on NIST and FEMA collaboration on building codes, Dr. Hayes stated that the collaboration is very real, and that FEMA deserves tremendous credit for its work with the building code community.

X. DHS Critical Infrastructure Protection Program

Presentation

Ms. Smith gave a brief overview of the relevant elements of DHS organization. The Office of Infrastructure Protection is responsible for the National Infrastructure Protection Plan (NIPP). The NIPP is organized by critical infrastructure type and key assets and addresses all vulnerabilities, including earthquake risk. A focus of her work is to consider economic impacts and long-term, cascading effects of disasters on society. Congress set this in place under the authorities for the National Infrastructure and Simulation and Analysis Center (NISAC). She then introduced Mr. Pless.

Mr. Pless described NISAC work. He stated that NISAC conducts focused studies for risk modeling and that hurricanes have been studied extensively. A multi-year effort is underway to study the NMSZ. Mr. Pless discussed the NMSZ scenario, a 7.7 magnitude event similar to the earthquake of 1812. He stated that if this event would occur today, the impact would be devastating across all infrastructure sectors. The soils in the region are prone to liquefaction capable of causing severe losses and disruption. There would be significant electrical power outages within the destruction zone and major disruption within the transportation sector. Mr. Pless also discussed impacts on Petroleum Area Districts (PADs) and disruption of crude oil and natural gas supplies.

Ms. Smith remarked on the importance of expanding the group of people who can answer the question “So what ?” when discussing scenario disasters and who can provide analyses of cascading effects. She mentioned that the NMSZ exercises conducted in 2011 will be supported

by analyses conducted by her office. The presentation materials from Ms. Smith and Mr. Pless were distributed to members at the meeting.

Discussion

A member commented that the American Lifelines Alliance (ALA) formerly brought interested parties together to discuss information sharing. The funding, however, disappeared and the meetings no longer take place. He asked if the Office of Infrastructure Protection plans on doing anything to revitalize this activity. Ms. Smith stated that there is now a focus on actively involving the states and establishing cooperation with the private sector. A member remarked that reaching out to all communities is critical because there is a tendency to overstate things we know and to understate what we do not know; the key is a collaborative effort of engineering, earth science, and other disciplines.

In response to a question about the design of scenarios for less catastrophic events, Mr. Pless responded that other scenarios have not yet been designed. Another member asked if the interdependencies of lifelines have been considered. Mr. Pless stated that these have been considered; for example, the assumption was made that there would be a reduction of electrical capacity within the zone of impact, impacting pumping and distribution facilities for water and fuel.

Mr. Poland asked about DHS infrastructure sectors and the NIPP. Ms. Smith described the sectors and the Government Coordinating Councils (GCCs) and Sector Coordinating Councils (SCCs) for each sector. DHS is the lead for seven sectors, with the remainder falling under different federal agencies (28 agencies are involved in the NIPP). A benefit of the NIPP is that it brings a broad, holistic approach to managing risk.

Dr. Sunder commented that the tools discussed should help communities to become resilient. He asked if there is way for the Office of Infrastructure Protection to partner with NEHRP on scenario development and loss studies. Mr. Pless stated that his Office would be open to discussion on how to structure the cooperation, perhaps through working groups. Ms. Smith agreed that collaboration would be a practical course. The Office is not aware of some challenges posed by earthquakes, and the earthquake community has insight that could help to improve the quality and use of their analyses. DHS is in the middle of a multi-year effort to build the analytical capability and maximum utility for those who can implement mitigation measures.

Mr. Poland asked if there is a comprehensive vulnerability and risk model for the entire United States. Mr. Pless responded that NISAC works on a suite of models. His center was asked to look at the impacts of the H1N1 virus. When the H1N1 broke out, a model was completed over a 6-week period. Last July, the conclusion that the impacts of the H1N1 would not be as severe as expected was not well received. The main point is that NISAC does a lot of diverse tasks with

a number of tools.

A member commented that a Bay Area utility would not provide data on gas and electric requirements. This presents a challenge in response planning processes that are trying to take into account cascading failures. He asked how NISAC obtains data. Mr. Pless responded that NISAC obtains data in a variety of ways, and that it helps if a national laboratory makes the request. He acknowledged that obtaining good data is a challenge, although some data gaps can be filled from indirect sources.

Mr. Poland asked if NISAC is fully funded. Mr. Pless stated that full funding is available for planned work. For significant efforts in an unplanned area, separate and additional funding is required.

XI. ACEHR 2010 Report to the Director of NIST

Overview

Mr. Poland reviewed the Trends and Projections section from the May 2008 ACEHR report and discussed the plan for completing the 2010 report.

Before discussing updates, Dr. Lindell commented that, in a large earthquake in a large urban area, a major problem is in the location of temporary housing. A solution is needed to the problem that many people want to stay in their neighborhoods. The problem is more pronounced for minorities and high vulnerability households. He added that the 2008 report does not contribute to the understanding and resolution of this issue. A member asked if this should be addressed under disaster response and recovery. Mr. Woodworth stated that housing issues have become a dominant social issue. He advised looking at the recent FEMA study on housing and social issues (he will provide a reference). Dr. Lindell offered to draft this section and submit it for review and a decision on where to include the discussion in the 2010 report.

Dr. Lindell also remarked on the need to move away from the risk assessment and risk communication discussion in the 2008 report, which, in his opinion, do not provide enough direction to individuals. Hazard and risk assessment, particularly for highly vulnerable households, should be given more emphasis. He added that the lack of program evaluation, particularly for outreach projects, at both the federal and state level is an issue. He stated that there also should be a better link between NSF and the work of the other NEHRP agencies to evaluate immediate and long-term outcomes of NSF research. He noted that FEMA wanted to conduct a study of the effectiveness of community-based stakeholder programs. Dr. Lindell added that a systematic assessment is needed of what households can do to stay safe and the barriers to implementing the actions required to do so. He stated that this can help to create a culture for hazard mitigation. Mr. Poland agreed that determining what people can do in the immediate aftermath of a catastrophe is critical.

Mr. Poland asked about including a special section in the report on ARRA funds. One member recommended including information on the specifics of ARRA funding for NEHRP activities, agency by agency, followed by an overall assessment of these expenditures (note that such a report would include a description of the statutory restrictions on ARRA funds).

Review of Trends and Projections

Mr. Poland asked the primary authors of the Trends and Projections sections in the 2008 annual report to discuss updates to their sections.

Earth Science

Dr. Arabasz offered that he will work with Dr. Zoback and Dr. Somerville to prepare a draft of this section. He has requested input by early December from the Seismological Society of America (SSA) Government Relations Committee. Other background information for updating this section will be reports and documents from relevant private groups and government agencies and panels. He indicated advances to be considered include ShakeMap, ShakeCast, PAGER, new attenuation models, multi-hazard demonstration projects, deployment of dense arrays, and improved probability assessments. The authors will assess innovations in computer modeling and social networking, such as the use of Twitter[®], as they might apply to NEHRP. He commented that he has been particularly impressed with efforts within the *Great California ShakeOut* to engage the younger age groups of society.

A member asked about building design maps, noting the need for further dialogue in this area in light of the debate on maximum response and ground motions. He noted that the production of these maps is an important achievement and should be recognized. Another member agreed that the controversy is very important and should be addressed. Dr. Arabasz will ask for advice from structural engineers on this issue and will include a discussion in the updated Earth Science section.

Mr. Poland noted that Dr. Applegate discussed new tools for calculating economic losses, such as LossPAGER. Collaborators at FEMA and USGS working in this area should provide additional information to ACEHR at a future meeting.

Geotechnical Earthquake Engineering

Dr. Bray highlighted the areas he will emphasize in his update to this section. These areas include the impact of geotechnical engineering on earthquake resilience, the natural linkage between geotechnical engineering and other disciplines, the need to incorporate the effective transfer of geotechnical engineering knowledge in the NIST earthquake research program, research on levees and flood protection systems, research to clarify ground movement and soil

structure interaction for practical applications, characterization of geo-material properties and uncertainties in their seismic response, archiving of geotechnical information following an earthquake; performance-based seismic engineering (PBSE), and better instrumentation of geotechnical structures including using down-hole arrays.

Other issues he will discuss include how to bring earthquake resilience into sustainability assessments, the application of innovative mitigation techniques to improve resilience, and needed research in other geotechnical areas.

A member remarked that an issue affecting low-hazard areas is site amplification of earthquake ground motions. The member indicated that standards and codes do not give good guidance in this area; guidance and research is needed, particularly on Site Class F (as defined in ASCE 7). Dr. Bray stated that good data is needed on high levels of shaking in these areas. He added that in general damage assessment of geotechnical structures, with impacts and repair time, requires further study.

Lifeline Earthquake Engineering

Dr. O'Rourke discussed some of the developments in this area since the last report, including work on lifeline components using shaking tables that has enabled better systems analysis. He emphasized the significant issue of recognition of large-scale problems caused when lifeline systems fail, and the interdependencies among lifelines and their importance to community resilience.

Dr. O'Rourke observed that of the ARRA funds designated for lifeline systems, a significant amount is being designated for the development of Smart Grid, while only a limited amount is designated for renewable energy. He indicated that some states want to increase their renewable energy usage by 20% in 20 years, thus raising the issue of how these systems respond to earthquakes and other hazards. He also stated that "Smart Meters" at the use point could help monitor the location and amount of energy consumption following a disaster.

Dr. O'Rourke remarked that the loss of support for the American Lifeline alliance (ALA) is significant and support for a new organization should be considered. He suggested that a workshop could be convened to address lifelines performance in a multi-hazard context. A member noted that DHS may provide a conduit for coordinating with lifeline groups. The member also recommended that the fire hazard triggered by earthquakes also be addressed in this section. Mr. Poland will see that Dr. O'Rourke receives an electronic copy of the NISAC presentation.

Structural Earthquake Engineering

Mr. Hooper commented that the 2008 report discusses high-level, older work. This section will

be updated to reflect the meeting discussions, including updates provided by NIST on its work, and accomplishments of the last 2 – 5 years.

Mr. Hooper remarked that many of the issues and challenges identified in the 2009 report remain relevant; however, the development of performance guidance for resilient structures is missing, as are definitions of quantifiable terms for resilience. He also identified the issue of quality assurance in design and construction.

A member remarked that mold contamination is now a very important issue. Other recommended issues identified for this section included mechanical systems, new design maps, PBSE for resilience, and existing buildings.

Disaster Response

Mr. Eisner stated that this section should be re-titled “Disaster Preparedness and Response.” In the preparedness area, it should be made clear that the *Great California ShakeOut* is the single flagship activity and that an assessment of it is needed.

Mr. Eisner stated that tools such as HAZUS are absolutely essential but that there is the need to return to the HAZUS 98 platform and to determine how to integrate modeling of the infrastructure into HAZUS. He remarked that animated tools, which are critical for preparedness and response, have had a huge impact and must be continued. He also noted the need to augment inventories, fragility curves, and social networking tools.

A member commented that social networking sites and the impact of public access to modeling tools are very significant and that Google™ will soon enable the public to access flood maps. In the member’s view the private sector will not wait for the federal government to improve distribution of information on seismic hazard modeling. This reflects the need to enhance the use of graphic hazard estimation tools and exercises. The gap between federal and state response coordination and capabilities also should be discussed.

Mr. Eisner stated that the focus should be more on loss than on hazard, giving as an example the important issue of how to keep small businesses from failing after a disaster. A study of how to integrate community-based responders into the response hierarchy also is needed.

Mr. Eisner stated that consideration should be given to involving NOAA and tsunami hazards into NEHRP. A member asked if NOAA and tsunamis could be mentioned in the context of the pending reauthorization focus on multi-hazard. It was generally agreed that this might be possible, but may not be necessary as FEMA already coordinates with NOAA on tsunamis.

Mr. Eisner stated that no one “owns” recovery. It is driven by local interests and governments, but no one has a comprehensive model setting out the issues, decisions, and practices that must

be addressed during the recovery phase. Dr. Applegate commented that the National Response Framework and the National Response Recovery Framework, co-led by DHS and the Department of Housing and Urban Development (HUD), can provide opportunities for collaborative work in this area (note that recovery is a very big issue involving many federal and state agencies, beyond the NEHRP mission area).

Review of NEHRP Agency Effectiveness

Mr. Poland reminded the authors to review the NEHRP Strategic Plan and other sources such as the 2009 NEHRP Annual Report and the PowerPoint presentations made at the meeting, before rewriting their sections. The agency sections should recognize the accomplishments of the agencies and acknowledge any changes in priorities.

USGS

Dr. Arabasz stated that USGS is doing a lot of good work and is meeting its responsibilities - there is much to commend. His section will include recommendations from SESAC that will be provided in December. The members agreed that the recommendations in the 2008 report are still valid.

Mr. Poland asked about other directions for USGS. A member stated that it is important to acknowledge the progress made by ANSS, although it is still not fully funded. The member asked if expansion of ANSS should be recommended. Mr. Poland stated that the report can refer to the need to expand ANSS, particularly as ARRA funds could not be used for maintenance and expansion. Another member commented that unless ACEHR addresses the telemetry of data from ANSS stations, expansion of ANSS instrumentation alone will not be sufficient.

NSF

Dr. Wood began by discussing two issues in the 2008 report: the loss of the earthquake engineering research centers (EERC's) and how to assess NEES. She acknowledged, from information provided during the NSF update, there now appears to be a schedule for assessing NEES. In terms of enhancing support for multidisciplinary research that was formerly conducted by the EERC's, she noted that Dr. Wenger's report indicated that there is now increased collaboration between NSF Directorates.

A member commented that requesting an increase in collaboration between NSF Directorates is not sufficient. The EERC's brought about real multidisciplinary collaboration. In the absence of the EERC's, ACEHR should consider urging NSF to fund more *Grand Challenge*-type projects on an ongoing basis. Mr. Poland commented that if NEES must stand independently, it may no longer be appropriate for ACEHR to retain the concept that NEES continues entirely within NEHRP. Dr. Wood agreed that NSF should hear from multiple constituents on the importance

of NEES.

The members discussed the need for a continuing recommendation for the NSF Engineering Directorate to collaborate with the Social, Behavioral, and Economic Sciences Directorate. Dr. Wood stated that NSF will most likely provide the same response as it did to the previous ACEHR report. A member stated that the recommendation should not be dropped simply because NSF did not respond in the way ACEHR thought it should. Another member remarked that the NSF response may have been predicated on concerns that ACEHR was recommending an earmark for earthquake work (The NSF response was that interested parties should submit proposals for earthquake work). Dr. Wood agreed that NSF believes it has responded to the recommendation and emphasized that NSF does not dedicate funds to earthquake engineering. The ACEHR options are to provide NSF with an explanation for not accepting their previous response or to drop the issue and move on. She observed that NSF's goal is to support "transformative" research and it is a challenge to address the research problems presented by an aging infrastructure under "transformative" research.

A member suggested that, since a primary avenue for *Grand Challenge* work has been lost, ACEHR may want to advise NSF to fund national security research on resilience. Another member remarked that NSF has always been about transformative research in all areas. Another option would be to advise the research community to submit proposals to NSF for this type of work. A member added that ACEHR also needs to accept that NSF supports basic research; if applied research in engineering is the desired focus, researchers should apply to NIST for support.

Mr. Poland recommended deleting "partner" from ACEHR recommendation #1. With regard to ACEHR recommendation #2 on curiosity-driven research, a member stated that NSF reviews all proposals against two criteria: broader application and intellectual merit, and does not see these criteria as mutually exclusive. For recommendation #3, Dr. Wood stated that NEES and all NSF collaborative work would be enhanced with the support of other federal agencies. Dr. Hayes stated that very few other agencies are even considering earthquake research today. He indicated that some of the NEES facilities are heavily utilized, so that greater utilization by other agencies would not be possible. Other NEES facilities are less heavily utilized. To a great extent, the utilization of individual facilities is driven by their capabilities.

NIST

Dr. Harris stated that NIST has received an increase in funding and has hired new staff in response to previous ACEHR recommendation #1. ACEHR should again recommend additional funding for NIST. The second previous recommendation relates to *The Missing Piece* document on developing research results for implementation. He stated that NIST moved very quickly to infuse appropriate projects with funds; moreover, there has been admirable coordination with FEMA on applied research, which should continue. A member suggested moving the first part

of recommendation #1 to Section 3 of the report. Another member added that NIST needs in-house expertise on lifelines and geotechnical engineering, along with an external grants program.

The committee discussed economic analysis expertise at NIST. Dr. Harris stated that this is a traditional component of work at NIST. Dr. Sunder added that it is indeed a strong component of NIST work. He stated that NIST has already begun to engage others on resilience issues and has started work with the Multidisciplinary Center for Earthquake Engineering Research (MCEER) in this area.

FEMA

Mr. Eisner commented that FEMA was an advocate for state and local programs 30 years ago and that the funds for the re-established state earthquake assistance program should revitalize this advocacy role. He added that the construction and regulations guidelines produced by FEMA are vital and must continue. FEMA E-74 (updating non-structural guidelines) is one example. FEMA also should continue its lead role in earthquake preparedness, response, and recovery. No other agency, including DHS, has this role.

Mr. Poland stated that the alignment of FEMA and DHS should be addressed under this section or in a new section of the ACEHR report. One member suggested including language on the need to leverage resources that FEMA can bring to DHS initiatives. Dr. Sunder recommended inviting the head of the DHS S&T Directorate to make a presentation at an upcoming ACEHR meeting. Mr. Laatsch mentioned that FEMA has been invited by the DHS S&T Directorate to participate on a working group to discuss areas of collaboration.

Regarding previous ACEHR recommendation #2 (fund FEMA earthquake work at the authorized level), a member urged caution when referring to “authorized” levels. Mr. Poland stated that ACEHR should look more closely at the activities that FEMA cannot undertake, because of lack of funding, but should be doing so according to the NEHRP Strategic Plan. A participant commented that lifelines, existing buildings, and outreach would fall under this category and that the HAZUS risk assessment module is in desperate need of updating.

One member commented that FEMA is doing a great job with available funding. From the state perspective, the re-establishment of the earthquake grants is great news and a huge boost. She agreed that fully supporting the states is one way to achieve a resilient Nation; however, more work is needed and the report should recommend funding FEMA at a higher level.

Review of the NEHRP Office

The committee agreed with Ms. Tubbesing to retain the one recommendation (post-earthquake investigations) as a NEHRP lead agency function and to commend NIST and the NEHRP Secretariat for the great job they are doing. Members agreed that the Post-Earthquake

Information Management System (PIMS) is a substantial and expensive undertaking and observed that there was an attempt to establish a framework for PIMS at the ALA PIMS workshop in 2008. It was generally accepted that further development of PIMS would require additional resources. Mr. Poland stated that ACEHR should make it very clear that PIMS is needed and should be funded. The members discussed the connection between PIMS, the NEES data repository, and the new NIST clearinghouse. It was acknowledged that the objective for NEES is very different from the objective for PIMS and the user communities are radically different.

Mr. Poland stated that a recommendation should be made on how to structure the NEHRP Office if certain contingencies occur, such as incorporation of the wind hazard and expansion of the research component. Dr. Sunder stated that there is no current organizational structure or entity at NIST for these functions, although efforts have been started to address them within the Building and Fire Research Laboratory (BFRL).

Plan of Approach

Mr. Poland asked the authors of assigned report sections to complete their draft sections by March 1, 2010. He encouraged the section authors to review available material, seek additional information if necessary, and write their drafts in a concise manner. He also asked those members not assigned a section to provide input to both him and to the section authors. The goal is to compile the drafts in time for a face-to-face working meeting on March 11-12 or March 15-16, 2010.

XII. Letter from ACEHR on Resilience

Mr. Poland recalled that Mr. Reed spoke about the President's interest in including earthquakes in the goal for achieving national resilience and invited ACEHR to communicate its thoughts to the ICC Chair, Dr. Patrick Gallagher, on what is needed to achieve this goal. Mr. Poland stated that ACEHR does not need to convince Dr. Gallagher that it is important. ACEHR must compose a letter that focuses on a simple and concise description of resilience and how to achieve it.

The members discussed means of measuring resilience and how to improve it. The committee discussed Mr. Reed's statement that national security is the same as homeland security and that earthquakes are national disasters and have a direct impact on homeland security. It was recalled that Mr. Reed also asked for ACEHR thoughts on the framework in which resilience can be built, particularly regarding crucial lifelines and infrastructure systems.

Dr. Sunder stated that cyber security is a significant challenge in that lifeline control systems are all computer-based. Control problems that can arise from an earthquake can cascade cross regions and nationwide, causing a huge impact on national security. A member noted that the

west coast is a significant supply source of electronics and disruption in this industry can cause a security issue. Another member commented that NEHRP was created because people recognized the need to reduce the impacts of earthquakes but that this was not called “resilience” at the time. NEHRP has been working on resilience for a long time.

Dr. Hayes stated that the Midwest floods in the 1990s caused diversions in rail traffic for hundreds of miles. This made him realize that a repeat of the New Madrid earthquake would totally disrupt traffic flow in the central United States, and could have a significant national impact for a long period of time. Earthquakes could also disrupt port facilities along the west coast with national implications.

A member stated that the President has acknowledged the importance of earthquakes and the similarities of earthquakes and terrorist attacks, both of which strike without warning and take lives and disrupt society. Another member commented that resilience is not proportionate across all groups of society and regions.

Another member stated that the letter should discuss life safety and the need to improve building codes and strengthen infrastructure and make it more resilient. The life safety aspect of building codes should be tied to resilience. The letter should emphasize the need for the consistent adoption of building codes across the United States and for inspections to enforce them.

Mr. Poland stated that the letter must be short and to the point. He advised addressing resilience in terms of preparedness and mitigation, response, and recovery, and discussed how these are implemented at the national, regional, and local levels. The committee agreed with his recommendation. Mr. Poland asked each member to write a one-page statement covering what he or she wanted stated in the letter. He asked the members to send Ms. Faecke their submissions by December 15. She will collate the submissions into a single document which will be discussed via a conference call meeting the second week of January. The goal is to have a letter to Dr. Gallagher by the last week of January, along with a request for a face-to-face meeting.

XIII. Public Comments

Mr. Wilkinson, Executive Director of CUSEC, stated that the central United States loss model discussed by Ms. Smith and Mr. Pless is but one of four. The Mid-America Earthquake (MAE) Center, the U.S. Army Corps of Engineers, Argonne National Laboratory, and other groups are working on the other models (FEMA is supporting the MAE Center study). The models are designated for different target audiences. He added that the National Level Exercise (NLE) 2011 is an exercise to test federal, state, and local plans for response and plans for long-term recovery. In none of the tests is NEHRP mentioned. This should be of concern since FEMA and the USGS are the primary agencies involved in the exercise. An Earthquake Response Plan that is now being developed will be tested during the NLE 2011. Mr. Wilkinson also reported that there has

been no resolution on the cost-effectiveness issue of building codes. This is a major challenge in the central United States. Evacuation issues also have become a significant problem and CUSEC will seek funding to study this issue.

Ms. Cerovski-Darriau with the American Geological Institute (AGI) introduced herself and stated that she is attending the meeting to learn about NEHRP and the status of the NEHRP reauthorization.

XIV. Adjournment

Mr. Poland thanked the members for their excellent participation in two days of meetings. In his view, ACEHR accomplished a great deal with discussions that were focused, on point, and constructive. He adjourned the meeting at 2:45 p.m. on November 24, 2009.

- End -