

**National Earthquake Hazards Reduction Program (NEHRP)  
Advisory Committee on Earthquake Hazards Reduction (ACEHR)**

**U.S. Geological Survey  
Golden, Colorado  
August 18–19, 2014**

**Meeting Summary**

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**Advisory Committee Members:**

Laurie Johnson, Chair	Laurie Johnson Consulting
Jane Bullock	Bullock & Haddow LLC
Craig Davis	Los Angeles Department of Water & Power
John Gillengerten	Consulting Structural Engineer
James Goltz	Advisor on Natural Hazards
Nathan Gould	ABS Consulting
Robert Herrmann	Saint Louis University
John Hooper	Magnusson Klemencic Associates
Ronald Lynn	Clark County (NV) Department of Development Services
Peter May	University of Washington
Jack Moehle	University of California, Berkeley
Kenneth Stokoe	University of Texas at Austin
Mary Lou Zoback*	Stanford University
Ralph Archuleta	Ex-officio member of ACEHR as Chair of the U.S. Geological Survey (USGS) Scientific Earthquake Studies Advisory Committee (SESAC)

\* Not in attendance

**NEHRP ICC Member-Agency Representatives and NIST Support:**

Howard Harary	NIST, Engineering Laboratory Acting Director and ACEHR Designated Federal Officer
Jason Averill	NIST, Acting Chief, Materials and Structural Systems Division
Jack Hayes	NIST, NEHRP Director and ACEHR Alternate Designated Federal Officer
Steve McCabe	NIST, NEHRP Deputy Director
Ed Laatsch	FEMA, Chief, Building Science Branch
Joy Pauschke	NSF, Program Director, NEES Operations & Research
Bill Leith	USGS, Senior Science Advisor for Earthquake and Geologic Hazards
Tina Faecke	NIST, NEHRP Secretariat
Felicia Johnson	NIST, NEHRP Secretariat
Brian Garrett	Consultant

## Speakers and Guests:

Harley Benz	USGS
Jay Berger	Earthquake Engineering Research Institute (EERI)
Lucy Jones	USGS
Elizabeth Lemersal	USGS
Jill McCarthy	USGS
Mark Petersen	USGS
Chris Rojahn	Applied Technology Council (ATC)
Linda Rowan	UNAVCO
Rob Williams	USGS
XiaoDan Sun	USGS visitor
XiaoXin Tan	USGS visitor

## Summary of Discussions

### I. Opening Remarks

Howard Harary welcomed attendees to this meeting of the Advisory Committee on Earthquake Hazards Reduction (ACEHR) and introduced the following new committee members: Jane Bullock, John Gillengerten, James Goltz, Nathan Gould, and Peter May. Harary described his role as the Designated Federal Officer for ACEHR, his strong support for the National Earthquake Hazards Reduction Program (NEHRP), and the objectives of the meeting (reiterated in more detail by Jack Hayes – see following).

ACEHR Chair Laurie Johnson thanked the committee members, invited speakers, and guests for coming to this meeting. She noted that this was the first ACEHR meeting at which none of the committee's original members were in attendance (their membership terms have expired), and the first meeting held since she succeeded Chris Poland as committee chair. She described her background in urban planning, her exposure to the growing national focus on community resilience, and her interest in how NEHRP fits into this "resilience movement."

Jack Hayes outlined the structure of the meeting, which was to begin with updated overviews of NEHRP activities. This would be followed by presentations relevant to NEHRP's role in all-hazards resilience. The meeting would conclude with committee discussions related to how NEHRP should engage with the resilience movement and how the committee should organize and prepare its next biennial report on NEHRP effectiveness. To get the committee started thinking about the biennial report, the Chair distributed and briefly reviewed a tabular summary of ACEHR's recent reports (available at [http://www.nehrp.gov/pdf/ACEHRAug2014\\_Johnson.pdf](http://www.nehrp.gov/pdf/ACEHRAug2014_Johnson.pdf)).

### II. Agency Overviews and Updates

#### A. NEHRP Overview

Jack Hayes presented slides (available at [http://nehrp.gov/pdf/Hayes\\_NEHRP%20Overview%20for%20ACEHR2014%20FINAL.pdf](http://nehrp.gov/pdf/Hayes_NEHRP%20Overview%20for%20ACEHR2014%20FINAL.pdf)) summarizing recent program-wide developments. In addition to the activities and changing membership of ACEHR, his remarks covered NEHRP

agency budgets, program reauthorization legislation in Congress, the NEHRP annual report for FY 2013, the NEHRP Secretariat office at the National Institute of Standards and Technology (NIST), and program planning activities related to post-earthquake investigations, research on lifeline infrastructure, and NEHRP applied research conducted by NIST. Copies of his presentation slides (and those of other speakers) were included in the ACEHR members' meeting notebooks, along with background information on program legislation, NEHRP agency roles, program priorities, and the NEHRP strategic plan.

## **B. USGS Earthquake Program Update**

Bill Leith's presentation (slides available at [http://nehrp.gov/pdf/Leith%20USGS%20for%20ACEHR%208-17-14%20\(1\).pdf](http://nehrp.gov/pdf/Leith%20USGS%20for%20ACEHR%208-17-14%20(1).pdf)) reviewed the NEHRP-funded components of the U.S.

Geological Survey (USGS), recent trends and developments in NEHRP funding for USGS, and current USGS products, progress, and issues related to earthquakes. The USGS Earthquake Hazards Program (EHP) has added a Twitter-based earthquake detection system to its suite of earthquake notification products. This Tweet Earthquake Dispatch (TED) system provides notification that a widely felt seismic event has occurred, especially for small events occurring in sparsely instrumented areas. USGS Prompt Assessment of Global Earthquakes for Response (PAGER) alerts are now sent to numerous federal and international organizations and are linked to disaster response activation processes at the Federal Emergency Management Agency (FEMA).

Leith reported that Congress and the Administration have recently increased or proposed increases in USGS funding for improved earthquake monitoring in the Central and Eastern United States (CEUS), for induced-seismicity monitoring and research, and for earthquake early warning (EEW) and other rapid disaster response capabilities. However, funding has remained flat overall for the NEHRP components of USGS.

Leith noted that the newly released 2014 USGS National Seismic Hazard Maps indicate that 42 states are at risk for damaging earthquake ground shaking. USGS is working with the National Science Foundation (NSF) and other federal partners to convert 160 portable seismic stations originally installed as part of the EarthScope Transportable Array into permanent stations in the CEUS, although more funding will be needed to support long-term operation and maintenance of earthquake monitoring networks in this part of the country. Borehole sensors need to be replaced throughout the Global Seismographic Network (GSN), and although the U.S. Department of Energy has provided funds for purchasing upgraded sensors, USGS currently lacks the funds needed to install these new sensors. USGS research on induced seismicity is focused on informing future protocols for siting and operating hydrofracturing-related injection wells; of particular concern are wells in Oklahoma, where seismicity increased by 50 percent between October 2013 and April 2014.

Leith described recent developments related to earthquake early warning (EEW), noting that the USGS and the Gordon and Betty Moore Foundation have so far invested approximately \$17 million in this loss-reduction strategy. As a result, a "ShakeAlert" prototype warning system is now issuing earthquake alerts to a variety of stakeholders in Southern California, and an operational system is under development. A recently completed plan for implementing the

operational system estimated that full West Coast implementation will require \$38.3 million for one-time construction costs and \$16.1 million annually for system operation and maintenance.

### **C. SESAC Update**

Ralph Archuleta, as chair of the Scientific Earthquake Studies Advisory Committee (SESAC), spoke about the role of SESAC and its recent observations and recommendations. Copies of his presentation (slides available at [http://nehrl.gov/pdf/Archuleta\\_SESAC\\_Rpt\\_ACEHR\\_2014%20FINAL.pdf](http://nehrl.gov/pdf/Archuleta_SESAC_Rpt_ACEHR_2014%20FINAL.pdf)) and SESAC's latest report on the USGS EHP were included in ACEHR members' meeting notebooks.

SESAC has advised USGS to balance EHP funding devoted to earthquake monitoring with that allocated to research and hazard assessment. In view of the flat funding trend for the EHP, major new initiatives such as EEW implementation will need to be funded separately. Archuleta discussed these SESAC recommendations as well as others related to the USGS National Seismic Hazard Maps and USGS Advanced National Seismic System. He concluded by identifying some of the major issues, opportunities, and potential directions facing the EHP.

### **D. NSF Earthquake Program Update**

Joy Pauschke provided an up-to-date overview of NEHRP-funded activities at NSF (presentation slides are available at [http://nehrl.gov/pdf/Pauschke\\_NSF%20Overview%20ACEHR\\_Aug2014%20FINAL.pdf](http://nehrl.gov/pdf/Pauschke_NSF%20Overview%20ACEHR_Aug2014%20FINAL.pdf)). These activities are largely administered through the Directorate for Engineering and the Directorate for Geosciences, but also extend into interdisciplinary research programs sponsored by these and other directorates.

The Directorate for Engineering has supported earthquake-related research through its George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES); through several of its ongoing, fundamental research programs (Hazard Mitigation and Structural Engineering [HMSE], Geotechnical Engineering [GTE], and Infrastructure Management and Extreme Events [IMEE]); and through its support for Post-earthquake, Rapid Response Research. Pauschke described how the NEES program is transitioning from its current configuration, which NSF has supported for the past 10 years, into a new form that NSF described in its NSF 14-054 Dear Colleague Letter entitled "Support for Natural Hazards Engineering Research Infrastructure and Research during FY 2015-FY 2019." The new configuration, called the Natural Hazards Engineering Research Infrastructure (NHERI), will be comprised of up to 10 cooperative agreement awards for research infrastructure operations. One of the NHERI awardees will be responsible for working with the natural hazards engineering research and education community to develop a decadal science plan for 2020 - 2029.

ACEHR members asked Pauschke about the reasons for the transition from NEES to NHERI. She indicated that NSF made this decision by carefully considering recent input received from the earthquake community, including the two 2011 National Research Council studies related to national earthquake resilience and grand challenges in earthquake engineering research, as well as a recent joint NIST/NSF supported study on research needs for windstorm and coastal inundation impact reduction. These studies reflected the growing national focus on community resilience to earthquakes and other hazards.

NEHRP-funded activities administered through the Directorate for Geosciences largely fall within the Seismological Facilities for the Advancement of Geoscience and EarthScope (SAGE) and the Geodesy Advancing Geosciences and EarthScope (GAGE) facilities. In cooperation with USGS, SAGE provides support for the GSN and the improvement of seismic monitoring in the CEUS. GAGE facilities provide GPS data that are now used for the USGS National Seismic Hazard Maps and may be used in the future for EEW systems. NSF's current plans support SAGE and GAGE through 2018 only, and several ACEHR members expressed concern over the as-yet uncertain future of this support beyond that date.

### **E. FEMA Earthquake Program Update**

Ed Laatsch presented slides (available at [http://nehrp.gov/pdf/Laatsch\\_FEMA%20Update%20for%20ACEHR2014%20FINAL.pdf](http://nehrp.gov/pdf/Laatsch_FEMA%20Update%20for%20ACEHR2014%20FINAL.pdf)) describing the FEMA Earthquake Program and its activities, which constitute a substantial portion of NEHRP's implementation efforts. The funding that FEMA has allocated to NEHRP activities has declined significantly since 2000, both in absolute dollars and as a percentage of the amount that Congress has authorized for these activities. FEMA also has several key regional earthquake program position vacancies that remain unfilled. As a result, the FEMA Earthquake Program has had to end its support for lifelines mitigation and reduce the scale of other activities. Nevertheless, Laatsch reported that FEMA's program continues to carry out a variety of NEHRP implementation efforts, and that these activities are being effectively leveraged through the program's many collaborative partnerships and outreach efforts.

Laatsch described how the program translates lessons learned and research results into technical and nontechnical guidance documents and tools; widely disseminates this guidance through program partnerships, training support, and outreach initiatives; and ensures that the guidance is appropriately integrated into ongoing building code and standards development processes. He highlighted the program's recent publications and training resources related to residential structures (new and existing), nonstructural mitigation, tsunami vertical evacuation facilities, performance-based seismic design, and the *NEHRP Recommended Seismic Provisions for Buildings and Other Structures*.

Also described were recent developments related to the funding assistance that the FEMA Earthquake Program provides to state earthquake programs. The direct distribution of earthquake risk reduction funds to state programs, which FEMA resumed in FY 2009 following a multiyear hiatus, was discontinued in FY 2012 when many states were unable to meet newly instituted fund-matching requirements. Since then this support has been provided to states indirectly through FEMA's regional and national partners, largely in the form of training and educational resources relevant to state programs.

### **F. NIST Earthquake Program Update**

Steve McCabe updated ACEHR on the NIST Earthquake Risk Mitigation R&D Program. NIST's NEHRP-funded activities comprise both the R&D program and the NEHRP lead-agency functions carried out through the NEHRP Secretariat. (McCabe's presentation slides are available at [http://nehrp.gov/pdf/McCabe\\_NIST%20Overview%20for%20ACEHR2014%20FINAL.pdf](http://nehrp.gov/pdf/McCabe_NIST%20Overview%20for%20ACEHR2014%20FINAL.pdf).)

The NIST earthquake R&D program is focused on getting needed information out to earthquake engineering practitioners. It does this by conducting applied research, both at NIST and through external contractors, and by communicating with the earthquake engineering community through program-sponsored workshops and staff participation on national standards-development committees. Given its relatively small share of NEHRP funding, the R&D program must prioritize its work. Priorities established by outside experts, through program-sponsored “roadmap” analyses and in standards-development committees, guide decisions on what work is carried out in the R&D program. Currently, most research is conducted externally through a contract with the Applied Technology Council (ATC), which can bring together experts from whatever disciplines are needed for each project.

McCabe provided a summary of the program’s research portfolio. Projects have included the production of “TechBriefs,” which are best-practices documents that concisely synthesize the latest research, expert opinion, and codes and standards applicable to design topics of particular interest to earthquake engineering practitioners. Approximately 20 additional projects, completed or initiated since 2011, have comprised problem-focused research or planning for such research, and additional research topics have been proposed for FY 2015. McCabe highlighted several of the completed projects, including one on the costs and benefits of earthquake-resistant construction whose results helped to motivate adoption of the current International Building Code seismic provisions by the Memphis/Shelby County, TN local government.

### **III. Presentations Relevant to NEHRP’s Role in All-Hazards Resilience**

#### **A. NIST Resilience Initiative**

Jason Averill, acting chief of the NIST Engineering Laboratory’s Materials and Structural Systems Division, spoke about the work of the NIST Community Resilience Program, which was recently established within the division. (Averill’s presentation slides are available at [http://nehrrp.gov/pdf/Jason\\_Resilience\\_ACEHR2014%20FINAL.pdf](http://nehrrp.gov/pdf/Jason_Resilience_ACEHR2014%20FINAL.pdf).) This program is focused on how the built environment (buildings and infrastructure) can contribute to disaster resilience in communities. The emphasis is not only on mitigating risk, but also on expediting recovery. The resilience program is one of the organizational components that fall under the Engineering Laboratory’s strategic goal on Disaster-Resilient Structures and Communities. Other components include NEHRP, Wind Research, Fire Research, Structures Research, and Disaster and Failure Studies. Collectively, these components seek to provide the critical knowledge, metrics, and tools needed to enable the emergence of performance-based standards and codes.

The resilience program is convening a series of four regional workshops with diverse community-resilience stakeholders. These workshops, which began in July 2014 and are scheduled to conclude in April 2015, are intended to finalize the initial version of a comprehensive Disaster Resilience Framework. After this, the program plans to establish a self-governing Disaster Resilience Standards Panel that represents the diverse stakeholder community. The panel will lead further development of the framework, use the framework to develop model resilience guidelines for critical buildings and infrastructure, regularly update the framework and guidelines, and recommend associated changes to standards and codes.

Averill noted that the resilience program is currently soliciting external proposals to establish a community resilience center of excellence. The center will provide support in the areas of computational modeling, data management, and field studies.

ACEHR discussed the resilience program, noting that the program's stakeholders should include urban planners, developers and contractors along with architects and engineers. It was suggested that the Disaster Resilience Framework should not only address how to construct and retrofit the built environment, but also provide guidance on where and when such work should be permitted, and how compliance with the framework can be influenced or incentivized.

## **B. EERI Report on Contributions of Earthquake Engineering to Multihazard Engineering**

Jay Berger, executive director of the Earthquake Engineering Research Institute (EERI), reviewed some of EERI's recent activities, noting that in addition to government agencies many academic and private-sector organizations have long contributed to advancements in earthquake risk reduction. As multihazard disaster resilience has garnered increasing attention nationally, innovations pioneered by earthquake engineering and earthquake risk reduction efforts have been adopted by, and adapted for, other hazard communities. This was documented in a 2008 EERI report entitled "Contributions of Earthquake Engineering to Protecting Communities and Critical Infrastructure from Multihazards." The report focused on contributions in the areas of planning, advanced technologies, emergency response, and community engagement. Berger reviewed some of the examples cited in the report under these areas. He also discussed more recent contributions related to crowd sourcing and remote sensing advanced by the GEO-CAN Consortium and their assessment of buildings following the 2010 Haiti earthquake. (Berger's presentation slides are available at <http://nehrp.gov/pdf/EERI%20-%20ACEHR%20Meeting%20-%20Contributions%20Report%20-%20Slides.pdf>.)

## **C. NEHRP Roadmap for Earthquake-Resilient Lifelines**

ATC Executive Director Chris Rojahn described a recent project funded by NIST to plan the research, development, and implementation activities that NEHRP should pursue over the coming decade to improve the earthquake resilience of lifelines. (His presentation slides are available at <http://nehrp.gov/pdf/Rojahn%20Lifelines%20Roadmap%20ACEHR%20Meeting%20-8-18-14%20rev.pdf>.) The resulting roadmap, which is currently under review at NIST, is organized around the following elements: establish national lifeline systems performance and restoration goals; develop lifeline system-specific performance manuals, guidelines, standards, and codes; conduct problem-focused research for various lifeline systems; and enable the adoption and implementation of lifeline system performance goals and standards. The plan addresses associated issues related to lifeline interdependencies, socioeconomic and institutional factors, and program management. Rojahn described how much of this work will have strong applicability to other hazards affecting lifelines, and consequently, to multihazard community resilience.

## **D. Lessons Learned in Advancing Seismic Resilience in Los Angeles**

Lucy Jones, USGS Science Advisor for Risk Reduction, spoke about her current one-year assignment as the mayor's science advisor for seismic safety in Los Angeles, CA. (Her presentation slides are available at [http://nehrp.gov/pdf/Lucy\\_LA%20Resilience%20for%20](http://nehrp.gov/pdf/Lucy_LA%20Resilience%20for%20)

[ACEHR2014%20FINAL.pdf](#).) Her task is to develop a seismic resilience plan for the city in consultation with building owners and other local stakeholder groups. In outreach meetings with these groups, Jones has discussed the linkages and interdependencies among the city's critical infrastructure systems and what is at stake in improving their seismic resilience. The goal of the resilience plan will be to enable the city to safeguard its economic viability by protecting lives during earthquakes and improving the city's ability to respond to and recover from damaging earthquakes. Jones highlighted a study comparing pre- and post-Katrina New Orleans to Nashville, which illustrated how disasters can impact comparative economic growth for years after they occur.

The resilience planning has focused on buildings, water, and communications, infrastructure systems that are within the purview of the city government. The specific recommendations that will be advanced in the plan are not yet finalized, and are scheduled to be announced on ShakeOut Day (October 16, 2014). Discussions among city officials, building owners, a technical task force of engineers, and other stakeholders have explored potential ways to incentivize demand for and development of structures that can protect their functionality as well as their occupants.

The city has obtained some external support for its resilience planning through the Rockefeller Foundation's 100 Resilient Cities Centennial Challenge. Improving seismic resilience in Los Angeles will require the cooperation of many varied entities (e.g., building owners and developers, private lifeline providers, foundations) whose decisions are not under the control of the city government; consequently, success in implementing the resilience plan will depend on finding ways to engage with and enlist the cooperation of these entities. Engagement is made easier, Jones noted, when the potential costs of inaction are expressed, as they are in this effort, in the form of the comprehensible data generated by earthquake scenario studies.

#### **IV. Closing Activities: ACEHR Discussions, NEIC Tour, and Public Input**

##### **A. ACEHR Discussion: Agency Priorities**

Noting that ACEHR can serve an advocacy as well as evaluative function, the Committee invited input from the NEHRP agency representatives in attendance on priorities, questions, or issues that they would like ACEHR to underscore or consider in upcoming meetings and reports. The responses are summarized below.

- Does ACEHR support the agencies' current activities as described in the agency updates presented at this meeting?
- How can or should the agencies integrate their NEHRP activities into the multihazard resilience movement? In particular, how can approaches pioneered by the earthquake community be applied to other hazards?
- NEHRP could perhaps benefit from cultivating ties with the National Emergency Management Association (NEMA).
- ACEHR can help in energizing and organizing an effective voice for the earthquake community.



- ACEHR can encourage the earthquake community to take further advantage of the cross-cutting, multihazard funding opportunities available at NSF, and to provide input on the future directions of NSF support for earthquake research infrastructure.
- The USGS EHP has become dependent on the SAGE and GAGE infrastructures, and its capabilities will be reduced if these resources are not maintained.
- NEHRP funding for USGS is increasingly being squeezed by greater demands for EHP products and services coming from outside NEHRP.

## **B. ACEHR Discussion: How Can Earthquake Risk Reduction Fit into Multihazard Resilience without Being Eroded or Subsumed by It**

Committee members generally agreed that the growing focus on multihazard disaster resilience presents opportunities, both to leverage additional support for the earthquake community and to share the relatively advanced knowledge and tools of the earthquake community with other hazard communities. ACEHR could develop recommendations about how NEHRP should pursue these opportunities. Lifeline infrastructure was cited as an area where the interests of earthquake and resilience advocates clearly coincide, and consequently, as an area that NEHRP could use to plug into the resilience movement. Others cautioned, however, that efforts to leverage and contribute to resilience initiatives should not be pursued at the expense of earthquake engineering, which still has major issues to overcome. Among these issues is the disconnect between the levels of building performance afforded by new-building (code-prescribed) design methodologies versus existing-building (i.e., more conservative,) methodologies.

There was general agreement that each of the hazards that must be dealt with to improve resilience has technical and scientific issues that are unique to that hazard (issues that have to be tackled in traditional, hazard-specific “silos”). It was also acknowledged, however, that there are some technical and scientific issues related to disaster mitigation, response, and recovery that are applicable to multiple hazards (these have been referred to as “resilience science” issues). Additionally, there are technical and scientific disciplines (such as information technology and computational modeling) that can support both hazard-specific and cross-hazard research. It was suggested that ACEHR could provide guidance as to how NEHRP resources should be apportioned among these three buckets (i.e., silos, resilience science, cross-hazard support).

## **C. ACEHR Discussion: Timing of Next Committee Meeting**

The Chair noted that ACEHR should submit its next biennial report to the NEHRP Interagency Coordinating Committee (ICC) by the end of FY 2015 (September 2015), and that consequently, ACEHR should hold its next face-to-face meeting in March or April of 2015 to allow sufficient time to complete the report with the aid of follow-on conference calls. The members in attendance felt that the month of April, and in particular the week of April 6–10 or April 13–17, would be the best time for this meeting. It was decided that the NEHRP Secretariat will send out a doodle poll to all committee members to determine which of these weeks, and which days within the chosen week, will be best for the meeting.

## **D. ACEHR Discussion: ACEHR’s Next Biennial Report to the ICC**

The committee discussed how their next report should be organized. Several possible approaches were mentioned, including the following:

- Use the full, long format last used in 2012.
- Use the shorter, supplemental format last used in 2013.
- Organize content around the three NEHRP goals.
- Organize the “program effectiveness and needs” content under basic research, applied research, and implementation.

As for the content of the report, a number of possible topics were suggested for inclusion by committee members and agency representatives.

- Issues identified in the agency presentations.
- The health of NEHRP under current budget levels.
- What kinds of research should NEHRP be funding now to enable communities to meet resilience goals in the years ahead?
- How can the NEHRP workflow, from basic research through applied research through implementation, be made more efficient and effective?
- Recommended funding priorities for the NEHRP agencies.
- The future direction and scope of NEHRP, particularly as they relate to multihazard resilience.
- Emphasize implementation, the Achilles’ heel of earthquake risk reduction, as well as how to bring about the major, concerted efforts needed to achieve earthquake resilience. Within implementation, emphasize retrofitting of existing structures.
- Affirm the continued relevance and applicability of the current NEHRP strategic plan.

There was also some discussion about how the “trends and developments” content could be improved by finding out more about the research being conducted throughout the earthquake community. No consensus was reached about how best to obtain this information, however.

Individual committee members volunteered to develop initial outlines or drafts of report content on topics that they or others had brought up during this meeting. The Chair volunteered to organize these topics into a draft outline of the report, and offered to review, organize, and edit the members’ individual drafts into one or more proposed versions of the report that can be distributed to the committee prior to its next meeting. Following are the topics to be addressed and the committee members who volunteered to work on them:

- Public perception that structures are better protected than they are (Gillengerten).
- Earthquake risk reduction in lifelines is not as far along as it is in buildings—further work on lifelines is needed across the board, from basic and applied research to implementation (Davis).
- How does NEHRP fit into the movement toward multihazard resilience (Gould)?
- Building rating systems (Lynn).
- Trends and developments (e.g., accomplishments, challenges, issues, needs, concerns) in earth science (Herrmann).
- Trends and developments in structural engineering (Hooper).

- Trends and developments in social science, including social science pertaining to implementation of earthquake risk reduction (May).
- NEHRP management and coordination (Bullock).
- Trends and developments in disaster preparedness, response, and recovery (Goltz).
- NEHRP workflow (basic research through applied research through implementation activities) (Moehle).
- Trends and developments in geotechnical engineering (Stokoe).
- Induced seismicity (Zoback).
- Assessment of the need for revisions to NEHRP (Johnson).

The Chair asked that in preparing their drafts, members review ACEHR's prior reports as well as the NEHRP strategic plan and the 2011 National Research Council report, "National Earthquake Resilience: Research, Implementation, and Outreach." She requested that members submit their section drafts to Tina Faecke at the NEHRP Secretariat, who will assist the Chair in organizing the submissions. Members will be contacted later regarding the due date for their submissions.

### **E. NEIC Tour**

Harley Benz, Scientist-in-Charge of the USGS National Earthquake Information Center (NEIC), took interested committee members on a tour of the NEIC facilities in Golden, CO. He described the composition and responsibilities of the staff, center operations, on- and off-site facilities, and current project work.

### **F. Public Comment Period**

Linda Rowan, director of external affairs at UNAVCO, was the only person who requested to address ACEHR during the portion of the meeting set aside for public input. UNAVCO, which is headquartered in Boulder, CO, is a nonprofit, university-governed consortium that facilitates the use of geodesy in geoscience research and education. The consortium is supported by NSF and the National Aeronautics and Space Administration.

Rowan described the facilities, functions, and partners of UNAVCO and how they intersect with those of NEHRP. UNAVCO operates the GAGE facilities under a 2013 award from NSF that is currently scheduled to end in 2018. As the spokesperson for UNAVCO and the Seismological Society of America, they both support the reauthorization and continuation of NEHRP and are concerned about the future of the GAGE and SAGE facilities after 2018. UNAVCO would like to see greater use of geodetic services by NEHRP for earthquake risk reduction. Rowan noted that the earthquake community can provide input on the future of GAGE and SAGE through participation in a September 2014 UNAVCO-sponsored workshop on the future of the Plate Boundary Observatory (a component of GAGE) and at the annual Fall Meeting of the American Geophysical Union in December 2014.

### **V. Adjournment**

The Chair thanked NIST for its work in planning and supporting this meeting, and thanked the ACEHR members, NEHRP agency representatives, and other speakers and guests for their participation and input. The meeting was adjourned at 2:15 p.m. on August 19, 2014.