

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

National Institute of Standards and Technology

Building 81, Room 1A116

Boulder, CO

July 24-25, 2017

**Meeting Summary**

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**Meeting Attendance**

**Advisory Committee Members:**

Laurie Johnson, Chair  
Jane Bullock  
Craig Davis  
Gregory Deierlein  
John Gillengerten  
James Goltz  
Nathan Gould  
Ryan Kersting  
Lisa Grant-Ludwig  
Robert Herrmann  
Peter May  
Lori Peek  
Glenn Rix, Vice Chair  
David Simpson  
Ralph Archuleta

Laurie Johnson Consulting  
Bullock & Haddow LLC  
Los Angeles Department of Water & Power  
Stanford University  
Consulting Structural Engineer  
CA Emergency Management Agency  
ABS Consulting  
Buehler & Buehler Structural Engineers  
University of California, Irvine  
Saint Louis University  
University of Washington  
University of Colorado-Boulder  
Geosyntec Consultants, Inc.  
IRIS Consortium  
University of California, Santa Barbara; Ex-officio member of ACEHR as Chair of the U.S. Geological Survey (USGS) Scientific Earthquake Studies Advisory Committee (SESAC)

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

Howard Harary	NIST, Engineering Laboratory (EL) Director and ACEHR Designated Federal Officer
Ken Snyder	NIST/EL, Deputy Chief, Materials and Structural Systems Division
Steven McCabe	NIST/EL, NEHRP Director
Edward Laatsch	Director, Safety, Planning & Building Science Division, FEMA
Michael Mahoney	Senior Geophysicist, Risk Management Directorate, Building Science Branch, FIMA, FEMA
Luciana Astiz**	Program Director, Geophysics Program and Coordinator for Education and Human Resources, Earth Science Division, NSF

Rick Fragaszy\*\*

Program Director, Geotechnical Engineering and  
Materials Program: NSF representative

William Leith\*\*

Senior Science Advisor for Earthquakes and  
Geologic Hazards, USGS

Tina Faecke

Program and Management Analyst, NIST/EL,  
Materials and Structural Systems  
Division/NEHRP

\*\*Participated remotely

## **Summary of Discussions**

### **I. Opening Remarks**

Howard Harary, NIST Engineering Laboratory Director and ACEHR Designated Federal Official, opened the July 2017 National Earthquake Hazards Reduction Program (NEHRP) Advisory Committee on Earthquake Hazards Reduction (ACEHR) meeting at 8:30 MDT. He welcomed Committee members and thanked them for their commitment. Harary noted that there were no members of the public registered to participate in the public comment session. Three federal agency representatives participated remotely via webcast.

Chair Laurie Johnson noted that all members of the ACEHR were in attendance; members and other attendees introduced themselves. Johnson stated the key purposes of the meeting: 1) to further develop the ACEHR 2017 report, and 2) to receive agency updates on NEHRP activities and a presentation on the USGS Scientific Earthquake Studies Advisory Committee (SESAC) activities.

She noted that the Committee was on track in following the report preparation schedule from the May meeting. Additional writing will take place in August; Johnson will integrate drafted sections and will schedule a call to finalize the report for transmittal to the NIST Director. The July meeting was intended to get member agreement on the report's structure, tone, and key recommendations.

### **II. Agency Overviews and Updates**

#### **A. U.S. Geological Survey (USGS) Update**

Bill Leith reviewed the USGS budget, characterizing the current year budget for USGS's NEHRP activities as relatively positive for the agency overall. In its fiscal year (FY) 2017 actions in May, Congress provided strong support and increased funding for earthquake-related activities at USGS.

For FY 18, the President's budget submission proposes reducing USGS earthquake funding by 15% (\$9 million). By contrast, the recent U.S. House of Representatives Appropriations Committee action would prioritize support for the Earthquake Early Warning (EEW) system, the Central and Eastern U.S. Network (CEUSN), and the Advanced National Seismic System (ANSS) regional networks. The U.S. Senate has expressed strong interest in the Alaska Transportable Array (ATA). The USGS anticipates continued congressional interest in long-term funding for that effort. The National Oceanic and Atmospheric Administration (NOAA) is interested in retaining these stations to assist in weather forecasts. Leith reported that

Congress had requested an “implementation plan” for retaining seismic installations; USGS indicated that retaining the seismic and geodetic monitoring networks is desirable, but not at the expense of any other parts of the earthquake program. The formal USGS response is due to Congress in November.

Leith reported that one-half of the budget for the USGS earthquake program now is allocated to monitoring activities. If the proposed House budget is supported in the Senate, USGS will provide funding for the CEUSN through FY 18 via IRIS (Incorporated Research Institutions for Seismology). The EEW program would maintain the additional \$2 million that was directed for EEW in FY 17. The President’s FY 18 budget proposal seeks to return the Global Seismographic Network (GSN) to funding levels below its FY 15 budget. The House rejected this proposal and their proposed budget would maintain flat funding, which would be used for installing more sensors and upgrading degraded vaults. Further details about the USGS earthquake program’s budget was included as part of Leith’s presentation to the Committee.

Leith reviewed the agency’s hazard assessment activities and the SESAC’s recommendations. SESAC recommended an update of the induced seismicity hazard maps. SESAC also recommended waiting for updates to the Alaska and Puerto Rico maps until a ground motion model is completed. Hawaii can move forward, and Operational Earthquake Forecasting (OEF) is a low priority. Leith updated the ACEHR on additional USGS research activities, including beta testing of an aftershock forecast tool.

Regarding the USGS’s strategic planning and future directions for subduction zone science, Leith reported that continuing issues were funding, relocation of the Earthquake Science Center from Menlo Park to Moffett Field, and relocation of the Northern California seismic network and the rock laboratories – which was still unfunded as the agency tries to identify an internal funding source. He said that USGS was considering how best to cover multiple hazard programs, beyond seismic hazards.

Members expressed interest in the USGS external research program. Leith said that through FY 17, USGS has been able to maintain funding for grants at the same level over about the last six years at \$5 to \$6 million annually, in addition to the \$6 to \$7 million devoted to seismic and geodetic networks. The administration’s proposed budget would target this external funding for reduction. The House is not supporting that proposal; Leith noted that USGS still loses about 2% per year in fixed costs due to inflation.

There is also support in the Senate for USGS earthquake-related activities where the interest, questions, and directions have to do with increasing the Alaska earthquake monitoring.

ACEHR members expressed concern about the allocation of USGS funding for monitoring overall, and discussed the relative importance of focusing on Alaska and the impact on monitoring activities serving the central and eastern U.S.

The ACEHR asked about the degree to which USGS has set priorities for future funding. Leith indicated that USGS has had to do that by default in light of its limited resources. The agency has prioritized “core” NEHRP activities in order to plan at the funding levels proposed in the

President's FY 18 budget. The Office of Management and Budget (OMB) Director has said that the administration is going to attempt to balance the budget within 10 years; agencies would need to reduce their budgets 2% annually for the next 10 years. If USGS receives a decrease, it will try to support its core activities, salary, and similar expenses.

Leith was asked about whether there had been public involvement in the USGS strategic planning efforts. He affirmed that the agency has sought and considered public input, including most recently at the natural hazards workshop earlier in July that included significant social science input.

ACEHR members followed up on Leith's concern about a "brain drain" at USGS, asking whether the agency was running mentoring programs to replace departing staff. He cited the longstanding Mendenhall postdoctoral program that brings new talent to USGS on two-year funding. All USGS programs participate in that effort, including the earthquake program. Funds have been set aside to attract post-docs for multi-year appointments, which has yielded very good results; USGS assigns high priority to retaining those individuals—something that also is at risk in the proposed FY 18 budget. In terms of hiring more social scientists into USGS, due to the lack of budget flexibility, Leith said that USGS prioritizes replacement of its scientific staff; refreshing its ground motion expertise is a current top priority.

The Committee asked USGS to provide copies of final strategic planning documents and drafts that could be released; Leith confirmed that he would provide those.

When asked about the status of the planned stations and a strong ground motion recording provided by CEUSN, Leith reported that with NSF matching funds, in FY 17 USGS is supporting the entire network plus four regional networks. All networks have a significant number of strong motion sensors as prioritized in the strategic plan. The USGS is working with NSF and IRIS to ensure FY 18 funding for CEUSN network operations, and with ANSS regional partners to establish a long-term operating plan for both the CEUSN and the existing regional seismic networks.

The issue of induced seismicity resulting from fracking was a topic of extended discussion. ACEHR members noted that the U.S. had not experienced any major earthquake activity for more than 10 years. Several members expressed interest in weighing in on induced seismicity and its significance for NEHRP. Leith noted that this is a complicated area; unlike a natural, large earthquake, politics are involved and it is a phenomenon that is subject to regulation. Committee members noted that induced seismicity crosses agency and discipline boundaries and has social, legal, and public education aspects.

Leith's full presentation is available at:

[http://nehrrp.gov/pdf/ACEHR\\_Update\\_USGS\\_NEHRP\\_Programs.pdf](http://nehrrp.gov/pdf/ACEHR_Update_USGS_NEHRP_Programs.pdf)

#### **B. Scientific Earthquake Studies Advisory Committee (SESAC) Update**

Ralph Archuleta, chair of the USGS SESAC, updated the ACEHR on SESAC's activities. No meetings have been held since September 2016 in light of the Secretary of Interior's temporary halt on all federal advisory committee meetings. SESAC is approved to meet in October 2017.

Archuleta noted that SESAC had discussed costs and benefits for monitoring stations in Alaska and had sent a letter to the USGS director recommending against funding the Alaska EarthScope stations at this time. SESAC was concerned that stations in Alaska “would come at a cost that would dramatically undermine earthquake-monitoring capabilities in the contiguous United States, which are already eroding.” The ACEHR members held an extended discussion about this issue and the pros and cons of expanding the Alaska monitoring network, including considerations of population density and diversity, and the current, less mature state of geological mapping in that area.

Archuleta also said that the USGS is following up on a SESAC recommendation to examine the cost estimate from the National Academy of Science/National Research Council (NAS/NRC) of the cost for the Earthquake Hazards Program to fully satisfy its mission of monitoring earthquakes and mitigating their effects. The agency’s current estimates are not far off: about \$190 million would be needed annually by USGS rather than the \$55 million it receives.

ACEHR discussed SESAC’s concerns about relative funding for monitoring and research-oriented activities, with SESAC recommending that monitoring should not exceed 50% of available resources. The discussion included questions about the value of earthquake early warning, involving a brief timeframe between a warning and a seismic event, including the socioeconomic values and relative costs and benefits. Members shared concerns about the sustainability of funding for early warning systems. They agreed that cutting the USGS earthquake budget by 2% annually would not allow the agency to maintain the same breadth of focus. The Committee agreed that it would be beneficial to ask questions about what USGS activities will be left behind and shut off, and what the remaining priorities will look like.

The Committee discussed the balance between SESAC’s scientific advice and ACEHR’s input; ACEHR is authorized to make recommendations on budgetary, political, and national-level issues. SESAC is to focus strictly on scientific issues.

Archuleta’s full presentation is available at: <http://nehrrp.gov/pdf/SESAC.pdf>

### **C. National Science Foundation (NSF) Update**

NSF presenters were Rick Fragaszy and Luciana Astiz. Fragaszy emphasized that NSF has no budget line item for NEHRP or earthquake-related research and that the agency made its awards strictly on a merit basis. Having said that, he noted that NSF supports fundamental earthquake research – earth sciences, earthquake engineering, and social, behavioral and economic sciences – through programs that support solicited and unsolicited proposals. Fragaszy provided updated information about NSF programs, awards, and publications in the Directorate for Engineering and the Directorate for Geosciences; most earthquake-related awards come from these two parts of NSF. Fragaszy noted that there were 924 active awards under the keyword “earthquake” in a recent search.

Almost all of NSF’s awards in this area are for unsolicited proposals. There are some awards under the category of RAPID (Rapid Response Research) following disasters, and under the EAGER (EARly-concept Grants for Exploratory Research) for high risk, high reward proposals.

There is now a vast amount of information from the earthquakes in Christchurch, NZ. Fragaszy said that this information is more readily available from building owners in that country than in the U.S. NSF had successfully leveraged New Zealand's interest in collaborating on a project; New Zealand contributed about \$5 million while NSF put in about \$400 thousand – a very good leveraging opportunity.

Fragaszy reviewed Natural Hazards Engineering Research Infrastructure (NHRI) progress, which evolved from the Network for Earthquake Engineering Simulation (NEES). The NHRI science plan is in draft form and is being used by NSF to set priorities. He also reviewed the status of the SAFE Seismic Facility and current Transportable Array (TA) deployment in Alaska, as well as the CEUSN (a joint effort with USGS). Fragaszy noted NSF's support for the Geodesy Advancing Geosciences and EarthScope (GAGE), National Geophysical Observatory for Geoscience (NGEO), and Prediction of and Resilience Against Extreme Events (PREEVENTS). Fragaszy briefly covered NSF's cross-cutting programs that relate to NEHRP goals. He said that NSF support for the Research Experiences for Undergraduates (REUs) is essentially 100% with grants provided until funding runs out.

Deep cuts at NSF, proposed at about 10% in the President's FY 18 budget submission, would have a substantial impact in earthquake-related areas. There is little information about how cuts would impact specific programs. When Congress appropriates funding to NSF, it usually does not provide details below the directorate level. Any reductions would affect awards to researchers and facilities, which could lead to imbalances in the NSF portfolio, and its workforce could well be reduced.

ACEHR members were interested in knowing more about the prospect for funding proposals under the SAFE and GAGE programs; Astiz said that proposals are still being reviewed. Members asked for clarification about some of the items classified as earthquake-related research since they appeared to fit more appropriately under the broader category of resilience and not necessarily related to earthquakes. Committee members wanted to know if NSF asks specifically for proposals related to the NEHRP strategic plan in these areas. Fragaszy said that NSF program managers provide that categorization and believe that there is earthquake-related value in the awards and publications that they have identified as being a NEHRP award.

Members and NSF representatives discussed why NSF does not have a line item for NEHRP. Fragaszy said that Congress does not give NSF funding by such a line item. Members asked about prior years when they believed that NSF did issue NEHRP program solicitations. Astiz noted that NSF funds earthquake-related RAPID grants when it receives qualified proposals.

The topic of the extent and nature of NSF's collaboration with other NEHRP partner agencies, including co-funding, was raised by the ACEHR. Fragaszy told the Committee that NSF mainly collaborates through joint funding. Since NIST has no geotechnical engineers, there is no one to talk with about that area. He said that NSF has made offers of co-funding with NIST on the engineering side but that has not yielded any results due to what NSF had concluded was a lack of NIST funding. NSF co-funds a significant amount with USGS, mostly in the geological sciences, because they do not fund the kinds of earthquake related research that NSF does. He said that NSF has co-funding arrangements with many agencies

outside of the earthquake arena. Astiz added that NSF Geosciences also funds the SAGE facility and co-funds GAGE with the National Aeronautics and Space Administration (NASA.)

Johnson asked whether NIST's and FEMA's lack of funds were the reason for those agencies not co-funding projects with NSF. McCabe said that with a budget about one-tenth that of NSF and USGS for earthquake-related work, the amount of funding that NIST can contribute is very limited. NIST regularly considers this and there are mechanisms for doing joint projects, but they can be challenging to put together. McCabe also pointed to the different thrusts between fundamental and more applied, practical kinds of research that the two agencies focus on in terms of earthquake-related work. An NSF solicitation that dovetails one with NIST could be a possibility. Ed Laatsch explained that FEMA is not permitted to do research, but his agency has cooperated on projects working with the results of NSF-funded research.

Fragaszy stressed that there is a lot of communication among the agencies and formal and informal collaboration between NSF and USGS. Likewise, Astiz said there are quarterly NSF-USGS meetings to share where they each are with different aspects of their work.

One member acknowledged that it is hard to co-fund projects given the limitations of funds and differences in mission. It is the development of coordinated programs among the NEHRP agencies that is really important and that the ACEHR was trying to get at in the discussion, he said. What the agencies emphasize in their work is more important than a particular co-funded effort, he suggested.

Fragaszy told the Committee that NSF often requests other agencies – including NIST, FEMA, and USGS – to serve on panels reviewing funding proposals. Astiz agreed that it is difficult to co-fund projects. One way to address those challenges is presented by NSF investigators who sometimes propose complementary proposals to another agency.

NSF's full presentation is available at:

[http://nehrrp.gov/pdf/NEHRP\\_ACEHR\\_NSF\\_July2017\\_final.pdf](http://nehrrp.gov/pdf/NEHRP_ACEHR_NSF_July2017_final.pdf)

#### **D. National Institute of Standards and Technology (NIST) Update**

Steve McCabe reviewed NIST's major program elements and mechanisms for combining internal and external capabilities. NEHRP was one of four program areas eligible to be part of NIST's FY 16-17 FFO (Federal Funding Opportunity). NIST received more than 70 proposals for funding under NEHRP, earthquake-related research; it is not yet clear how this award program may be implemented in FY 18. He cited an example of synergy via projects to be funded that tie into NSF-funded and FEMA work.

McCabe singled out several projects for the Committee, including ongoing work to look at how much the strengthening of Federal buildings to resist earthquakes has actually cost. That study will yield valuable data to inform the earthquake community. He referred to a project on non-structural components and systems undertaken for NIST by the Applied Technology Council (ATC). This project was begun by NIST based on a recent roadmap for research needs that identified non-structural systems in buildings, an area where the building code provisions had not been reviewed for nearly 20 years. A major concern is non-

structural earthquake damage; in places like hospitals, all of the internal equipment inside structures must be working for these structures to function.

McCabe told the Committee that NIST shifted in FY 17 from funding ATC to funding high quality FFO proposals. He also said that NIST-funded projects entail partnering with other agencies, including international collaboration, along with internal efforts. NIST is examining previously damaged concrete buildings to see how well the reported damage agrees with an ASCE 41 assessment. NIST is collaborating with the University of Auckland, which is providing expertise and studying NZ buildings.

NIST sees several possibly promising innovations from funded projects. For example, the community does not know how designs for seismic and wind loads fit together. NIST will perform collapse assessments on a suite of buildings to see how they work in terms of looking simultaneously at designs for moderate seismic and high wind loads. Boston and Memphis are among the candidates for building location. Two different building code eras will be examined, codes from the early 1980's as compared to present International Building Code-produced buildings. This project should provide valuable information about whether or not building performance has improved over time in terms of designing for seismic and high wind events.

McCabe told the Committee that NIST hired two structural engineers in July and that a AAAS fellow would join soon; these additions will allow NIST to do more internal research. Noting that each mechanism had strengths and weakness, at some point, he said, NIST will resume its significant work with contractors.

McCabe made the following additional comments:

- NIST was paying increased attention to existing buildings, because they constitute the largest portion of the nation's building stock.
- In FY 17, NIST's Earthquake Engineering Group put in a major effort to evaluate Federal Funding Opportunity (FFO) research grant proposals.
- Working with the NIST Structures Group; new equipment was installed in a new laboratory that offered additional capabilities for earthquake-related research.
- The Earthquake Engineering Group is collaborating with the NIST Community Resilience Group as well as the NIST Community Resilience Center of Excellence at Colorado State that brings ten academic centers together.
- NIST is planning to hire a geotechnical research engineer, adding a capability that it currently does not have.

McCabe's full presentation is available at:

[http://nehrl.gov/pdf/NIST\\_2EG\\_Overview\\_for\\_July2017\\_ACEHR\\_Mtg\\_07212017\\_FINAL.pdf](http://nehrl.gov/pdf/NIST_2EG_Overview_for_July2017_ACEHR_Mtg_07212017_FINAL.pdf)

Committee members weighed in on these developments, especially NIST's plan to assess seismic and wind load designs for the same structures. They offered several suggestions about how to approach that project (including a suggestion on adding a structure in an area of the country subject to induced seismicity).

### **E. Federal Emergency Management Agency (FEMA) Update**

Edward Laatsch reviewed FEMA's priorities and responsibilities under NEHRP and current staffing. He reported that, for the first time in a long time, the agency was fully staffed in each region with earthquake program managers.

Michael Mahoney reviewed several FEMA successes, including a new school safety guide for natural hazards. This is a multi-hazard guide, and costs were shared within FEMA. It is targeted primarily at school administrators and staff. Available online and is being printed now. FEMA plans to promote the guide in conjunction with school-related outreach events. One ACEHR member noted the importance of this guide at a time when school safety was so oriented toward active shooters.

Mahoney reported on a project to update Performance-Based Seismic Design for Tall Buildings (FEMA P-1092) that very successfully leveraged PEER funding, which received \$1 million from the Charles Pankow Foundation for this work. FEMA contributed \$50K to print a joint paper document.

Mahoney also discussed other completed projects:

- HAZUS updated annual losses
- Recommended simplified provision for seismic design category B buildings
- Improving earthquake performance of manufactured homes – a training course developed for FEMA by ATC

He also reviewed FEMA's role and recent progress working to update model building codes to incorporate improved seismic provisions. Mahoney expressed strong concern about developments in Florida, which recently passed a law that FEMA believes could essentially destroy the code process if it is repeated elsewhere around the country. The Committee engaged FEMA in further discussion about this situation, with several members agreeing with FEMA's assessment and suggesting that this issue be addressed in ACEHR's 2017 report.

Mahoney also advised the Committee that FEMA was trying to update the earthquake safety guide for homeowners but lacked necessary funding. That is also the case with other key earthquake-related documents. Accordingly, the agency has been forced to withdraw from further distribution of the homeowners' guide and several other key documents. Again, several Committee members recommended that ACEHR's 2017 report address this situation.

Laatsch reviewed important policy actions that former Administrator Craig Fugate took before his departure; he instructed that any funds distributed from FEMA's Public Assistance programs include a requirement that the recipient would need to meet all current building codes.

In addition, Laatsch updated the Committee on the following topics:

- FEMA's work with NIBS on the national "Mitigation Saves" study, due to be completed in September 2017. Both the Department of Housing and Urban Development (HUD) and the Commerce Department's Economic Development Administration contributed funding to this project.

- Progress with QuakeSmart, which is FEMA’s business outreach initiative to encourage mitigation measures. The agency is reaching out to Chambers of Commerce and pushing the following message: “know your risk, make a plan, take action.”

FEMA’s earthquake-related budget has been about \$8.5 million for the last several years. The agency is now operating under the assumption that it will have that amount in FY 18 after Congress completes its appropriations.

FEMA also is working on a “losses avoided” study in an attempt to quantify the costs of not following building codes. It has identified how such a \$2.5 million national study would work; FEMA now has dedicated the funding for that study. FEMA will work with local jurisdictions to gather earthquake, flood, and annualized loss data and use that to design better mitigation initiatives.

Several ACEHR members stated that they were impressed by how much FEMA could accomplish “on a fraction of funding the agency should get.” They asked what activities are being set aside because FEMA’s NEHRP funding levels are low. The Committee requested to have tangible information that they could use to address this problem in their 2017 ACEHR report. Mahoney said that FEMA had removed six or seven documents from its warehouse because they are out of date; a Committee member requested a list of these publications. Laatsch told members that there is a gap in knowledge about how existing buildings would respond to seismic events, but FEMA has not been able to do significant work on issues relating to existing buildings due to lack of funding. Responding to a Committee question, he reported that FEMA devotes about \$3.3 million to states, regional consortia, and partners.

FEMA’s full presentation is available at:

[http://nehrrp.gov/pdf/FEMA\\_briefing\\_for\\_ACEHR\\_final\\_24July2017\\_rev.pdf](http://nehrrp.gov/pdf/FEMA_briefing_for_ACEHR_final_24July2017_rev.pdf)

#### **F. NEHRP Update**

Steve McCabe reviewed the budget trend for the NEHRP program and its partners. Appropriations for FY 17 increased slightly. The agencies have received no specific guidance related to NEHRP programs as part of the President’s proposed FY 18 budget. Several agencies face overall reductions that could have a very significant impact on the program.

McCabe noted that he had been selected as the new NEHRP Director following Jack Hayes’ retirement in December. He covered progress since NIST was directed under Executive Order (EO) 13717 to re-launch the Interagency Committee on Seismic Safety in Construction (ICSSC). The EO emphasizes that it is federal policy to strengthen (improve) national earthquake resilience, to promote public safety, economic strength, and national security. It establishes minimum levels of seismic safety in buildings owned, leased, financed, or regulated by the federal government, which is to be achieved by satisfying the requirements of referenced building codes and standards. In January 2017, NIST published guidelines to implement EO 13717.

NEHRP is required to update standards for seismic safety for federal buildings. A draft update has been completed by ATC, reviewed independently, and will go to the ICSSC for

release. That document should provide agency engineers with a technical justification for determining whether a building is high risk.

A major new assignment from Congress, McCabe noted, is that NIST – in coordination with other agencies and Standards Developing Organizations (SDOs) – must provide a plan within the next year to develop an immediate occupancy building performance objective so that those structures could be brought back online quickly after a seismic event. The Science and Technology Policy Institute (STPI) will work on this, and the activity will include a workshop with the goal of incorporating results into federal design standards as well as the International Building Code (IBC). There are significant obstacles, including consideration of interior non-structural equipment performance as well as that of the structure, and the issue of multi-hazard design.

Dr. Katherine Johnson, AAAS Fellow, will start working at NIST in September 2017 on NEHRP policy issues associated with earthquakes. She will focus on post-earthquake expectations for the functioning of buildings, lifelines and communities. She will collaborate with the NIST Resilience Group, the University of Colorado Natural Hazards Center, and Dr. Lucy Jones, now a consultant.

The Committee discussed at length the overall situation for NEHRP funding and the most appropriate way for ACEHR to make a strong case about the agencies' need for funding. After the final discussion on this topic, the Committee decided to state its concerns in the text of the upcoming 2017 ACEHR report.

Picking up on earlier discussions, the Committee asked NIST and FEMA about the degree to which they are able to make use of NSF-funded research, and whether those agencies can help to encourage NSF to address certain areas needing attention. McCabe said that NIST relies heavily on NSF's input. As an example, he cited the NIST experts to participate in NSF panels reviewing proposals. He said that NIST is always interested in, and encourages NSF to consider, what the NEHRP agencies need to have done. He added that while there is a lot of coordination with NSF, there could always be more. Mahoney told the Committee that FEMA always transmits to NSF relevant proposals that his agency cannot fund. In addition, FEMA takes advantage of NSF's investment when it brings in universities and graduate students to perform some of FEMA's work.

FEMA was asked about how it delivers software to the community for use; representatives told the Committee that customers want both hard copy and online resources. FEMA would like to see a private sector organization pick up responsibility for maintaining software, which is both time-consuming and costly for FEMA.

Committee members discussed several other areas of interest:

- Pending legislation to reauthorize NEHRP (which had been recommended in an earlier ACEHR report), including provisions that relate to state matches to FEMA provisions.
- A proposed Government Accountability Office (GAO) review of earthquake programs and mapping of earthquakes. The assessment idea originated with ACEHR.
- The appropriateness of ACEHR, or its members, commenting on specific proposed reauthorization legislation and if/how to incorporate these thoughts into the ACEHR 2017 report. (As was the case with NEHRP agency budgets, Committee members

decided to use the report as the most appropriate vehicle; NIST will post the report on the website and share with key congressional committees.)

### III. ACEHR Report Discussions

The Committee had extensive discussions about their draft report, including a review of the key audiences (NIST Director, NEHRP agencies – including new officials coming onboard – as well as congressional staff indirectly). Members expressed the desire for a hard-hitting report that would acknowledge positive developments as well as multiple areas of concern – especially overall funding levels. One member noted that other than the USGS, which has a NEHRP budget line item, funding for earthquake-related activities are decided by the agency.

The Committee expressed concern that the long period since the last major U.S. earthquake resulted in the issue losing attention, and NEHRP agency specialists who have real knowledge of and experience with earthquakes are leaving or have left their positions. Members also addressed the value of pointing to estimates of economic losses if another strong earthquake occurs, noting that elected officials will pay more attention if they know the economic and political consequences. Members agreed that instead of just taking stock, this is a time when the nation has a chance to change the future of earthquake hazards reduction – and ACEHR has a role to play in its upcoming report.

How best to address induced seismicity was a major discussion topic. It crosses the interagency, interdisciplinary nature of NEHRP. The Natural Hazards Center Workshop in Boulder earlier this July helped to focus on the legal, social, and insurance issues. A large lawsuit has already been settled for the Pomona, CA earthquake. Insurers are trying to figure out how to reconfigure their portfolios. A hypothetical Oklahoma City M6.0 scenario was predicted to incur \$10 to \$20 billion in losses.

The Committee also discussed the value of – and risk in – managing technical programs and messaging about how earthquakes are one category of the multi-hazard events that could affect buildings and communities. One member talked about portraying NEHRP as being at a crossroads and in real jeopardy:

- The program, adjusted for inflation, is atrophying and awful consequences could result.
- The current Interagency Coordinating Committee (ICC) structure is ineffective.
- Although each agency is doing good work individually, there is no strong focus on where the nation should go.

The merits of re-raising the Committee's concern about the failure of the ICC to meet as directed and working together as anticipated by the NEHRP authorization was also a topic of discussion as members considered how best to revise the draft report.

In response to a question, McCabe noted that even though the latest NEHRP Strategic Plan covered 2009-13, the agencies are still implementing it because many of the activities remain pending. Members talked about the relative value of the NEHRP agencies revising that plan, noting that a lot has changed, including resilience. McCabe confirmed that there is no specific management plan.

A potential seismic performance ratings system for buildings was reviewed at length. Members discussed the practicality and costs of such a system and whether or not to include recommendations for the NEHRP agencies to play an active role in establishing such a system and/or to comment on existing schemes.

The Committee then discussed agency-specific recommendations to be included in the report and how best to communicate them in the final version.

At the opening of the second day's meeting, no members of the public were registered to comment. The Committee broke into working groups to address comments raised during the preceding day's discussions about their draft report and then reconvened to review the structure, themes, and recommendations. Major topics included NSF's lack of NEHRP-specific program solicitations, how best to address the issue of a building rating system, induced seismicity, suggestions regarding NIST's pending wind-seismic design project, the importance of including the social sciences in NEHRP planning, the brain drain at various agencies, and budget and staffing shortfalls. Members discussed missed opportunities for the agencies due to funding constraints.

The Committee considered the most significant emerging trends and new developments in science and engineering to be featured in the NEHRP report. Members agreed on a small set of potential topics to be developed by four members for further refinement prior to the Committee's consideration in the next version of the draft report.

Laurie Johnson noted that the Committee had made more progress in advancing the draft report than she had anticipated. She will knit together the revised components that the Committee worked on during the meeting. Some of the budget concerns will appear in the report introduction and some will be given attention in the cover letter to the NIST director. NIST will distribute the next draft to ACEHR members before August 14, with comments due in a week. Then a revised draft will be distributed and a webinar meeting held to review and finalize the report after Labor Day. NEHRP staff will canvass ACEHR and the NEHRP Program Coordination Working Group members for the best dates and times.

#### **IV. Adjournment**

Johnson thanked Tina Faecke for her meeting preparation and full attendance for the meeting. Harary expressed appreciation to the Committee members for their participation and contributions to the NEHRP program.

The meeting was adjourned at 1:35 p.m. MDT.