November 2011 Update
National Science Foundation (NSF) in the National Earthquake Hazards Reduction Program (NEHRP)

Presented to the NEHRP Advisory Committee for Earthquake Hazards Reduction (ACEHR)
November 8-9, 2011
Washington, DC

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Presentation Outline

- Post-earthquake rapid response research support
- CAMRA
- EarthCube
- NEES Update
- Progress on studies for earthquake engineering research infrastructure support beyond 2014
Post-disaster Rapid Response Research Support

- 2010/2011 New Zealand (NZ) earthquakes and 2011 Japan earthquake/tsunami
  - NSF 11-045 and 11-049 Dear Colleague Letters for RAPID proposals
  - Over 60 RAPID Awards: CISE, EHR, ENG, GEO, OISE, OPP, SBE
  - Workshop on Research Needs Emerging from the NZ and Japan RAPIDs
    - NSF ENG Award 1154279, Earthquake Engineering Research Institute (EERI)
      http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1154279
    - Location: National Science Foundation, Arlington, VA, February 9-10, 2012

- August 23, 2011 Virginia Earthquake
  - GEER Report
  - NSF GEO Awards 1160663 and 1160666: IRIS/PASCCAL EarthScope Flexible Array instrumentation deployment to capture aftershocks to identify seismogenic structures at depth as well as energy propagation characteristics

- Eastern Turkey October 23, 2011 earthquake

- Workshop on Deploying Post-Disaster Quick-Response Reconnaissance Teams
  - NSF ENG Award 1153981, University of Delaware, James Kendra, PI
    http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1153981
  - Location: National Science Foundation, Arlington, VA, June 11-13, 2012
Creating a More Disaster Resilient Community (CAMRA)

- ENG, GEO, and SBE
- Focus - interdisciplinary program for disaster resilience, vulnerability, and risk reduction
- Workshop held during June 2011 at NSF
- Recommendations
  - Focus on natural and technological hazards
  - Focus on interdisciplinary research
  - Stimulate comparative hazard research
  - Facilitate long-term data collection activities
  - Form a collaborative network of multidisciplinary observatories
CAMRA Workshop Report
Conceptual Representation of CAMRA’s Research Agenda

Geoscience based models of natural hazards, biophysical systems, ecosystem services, anthropomorphic impacts (land-use change).

Social and behavioral models related to risk, land use change, hazard mitigation, response, recovery and social vulnerability.

Engineering models of built structures, infrastructure and potential hazard impacts.

Models of coupled socio-ecological system vulnerability, risk and resiliency.

(Figure 1 of Workshop Report)
NSF GEO Update - EarthCube

http://www.nsf.gov/geo/earthcube/index.jsp

- Develop national integrated data infrastructure for earth system science
- Timeline
  - On-line community information (August to November, 2011)
  - EarthCube charrette (November 1-4, 2011)
  - Post charrette (Mid-November to April, 2012)
  - EarthCube ideas/lab (Tentatively Early May, 2012)
  - Prototype development (May to December, 2013)
  - Fully integrated geosciences infrastructure (2014-2022)
NEES Community

3200 registered NEEShub users and thousands of NEES users of equipment sites and cyberinfrastructure at any point in time highlight the global reach of NEES.
NEES Project Warehouse for Experimental Data Archiving
http://nees.org/warehouse

NEEShub Project Warehouse is the centralized data repository for sharing and publishing earthquake engineering research data from experimental and numerical studies. The data in the Project Warehouse are associated with research projects funded by a variety of agencies, including the National Science Foundation, and include experiments performed at NEES and non-NEES equipment sites.

Learn more
NEES Updates/Highlights

Workshop and five-story test on base isolation and non-structural systems at Japan’s E-Defense shake table facility during August 2011 (NSF NEESR Awards 1113275, Keri Ryan, PI and 0721399, Emmanuel Maragakis, PI)
Limitations of Current Liquefaction Mitigation Techniques:

- expensive
- not applicable for existing structures

NEES-R Research Goal: A New Mitigation Technique, IPS:

- cost-effective
- easy and wide application
- for existing and critical structures

Induced Partial Saturation (IPS)

Fundamental research combining analytical, laboratory, and field investigations to develop IPS as a cost-effective liquefaction mitigation measure.

Graphics courtesy of Professor Mishac Yegian, Northeastern University, PI
Seismic Resilience of Curved Bridges
NEES facility at University of Nevada, Reno

Prototype and model dimensions

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Prototype</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Length (ft)</td>
<td>362.5</td>
<td>145</td>
</tr>
<tr>
<td>Span Lengths (ft)</td>
<td>105-152.5</td>
<td>42-61.42</td>
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<tr>
<td>Radius at c.l. (ft)</td>
<td>200</td>
<td>80</td>
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<tr>
<td>Total Width (ft)</td>
<td>30</td>
<td>12</td>
</tr>
<tr>
<td>Girder Spacing (ft)</td>
<td>11.25</td>
<td>4.5</td>
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<td>Column Height (ft)</td>
<td>20</td>
<td>8</td>
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</tbody>
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Six F250 trucks on bridge model
(fish-eye view)

Graphics courtesy of Professor Ian Buckle, University of Nevada, Reno
Project supported by FHWA, Caltrans, and NSF/NEES

national earthquake hazards reduction program
NSF Engineering - Program Planning for Future of Earthquake Engineering Research Infrastructure Support beyond 2014

- Dear Colleague Letter informing community of planning process for the future of earthquake engineering research infrastructure support beyond 2014 (NSF 10-071)

- Community input for research agenda and infrastructure requirements

- Two evaluation studies during 2010 - early 2012
  - National Research Council (NRC)
  - Science and Technology Policy Institute (STPI)
NSF Planning Framework for Future of Earthquake Engineering Research Infrastructure Support

Community Input for Grand Challenges Research Agenda and Research Infrastructure

NRC Workshop on Grand Challenges and Networked Facilities (March 14-15, 2011)

STPI Study: Retrospective and Prospective (2010 – early 2012)

NSF Decision for Plan beyond 2014

NSB Information Item & NSF Dear Colleague Letter (by Fall 2012)
Five Grand Challenges

• Community Resilience Framework
• Decision Making
• Simulation
• Mitigation
• Design tools
## NRC Workshop Recommendation: Network of Facilities

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>Facility Description</th>
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</thead>
<tbody>
<tr>
<td>Community resilience observatory</td>
<td>Networked geotechnical centrifuges</td>
</tr>
<tr>
<td>Instrumented city</td>
<td>Soil-structure interaction shake table</td>
</tr>
<tr>
<td>Earth observation</td>
<td>Large-scale shake table</td>
</tr>
<tr>
<td>Earthquake engineering simulation center</td>
<td>Advanced structural subsystems characterization facility</td>
</tr>
<tr>
<td>Earthquake engineering data synthesis center</td>
<td>Non-structural, multi-axis testing facility</td>
</tr>
<tr>
<td>Rapid post-earthquake monitoring facility</td>
<td>Mobile facility for in situ structural testing</td>
</tr>
<tr>
<td>Sustainable materials facility</td>
<td>Tsunami wave simulator</td>
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Further Information

National Science Foundation

http://www.nsf.gov

CMMI Grantees Conference and NEES Annual Meeting

July 8-12, 2012
Boston, MA

http://www.cmmigranteecconference.org/